The Chemical Age

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Notes and Comments

John William Hinchley

MRS. HINCHLEY has done real service in writing a memoir of her deceased husband. They were close friends from early student days at South Kensington, from 1893 onwards. Only a slight volume, of 142 pages, the memoir's worth is in no way to be measured by its size: a closer, more admirable portrait, could not well be painted. The book is printed for private circulation but we hope that it may be ranged upon the shelves of many libraries, as one to be read by young men about to make the great adventure into the world. Mrs. Hinchley has carried through her difficult task not only with literary skill but with restraint and judgment. She draws a living picture, with full sense of proportion, free from exaggeration. Hinchley had a wonderfully varied and interesting career. Nothing sensational is recorded of his early years. He had fingers and character from both father and mother. His ultimate success as a teacher and as a pioneer "technical engineer," an as yet indefinitely defined species, may be ascribed, in large measure, to the wide experience he had before lapsing into the teacher's chair, for which he proved himself to be so eminently fitted. His success was far more due to his personal qualifications than to his mere knowledge and skill—to the art with which he practised his profession. We think of him in the sense of the remark of the good woman who said:—"'e's me friend rather than me 'usband."

He was ever his students' friend, not merely their teacher. His own course of training probably was that best suited for a chemical engineer. He first served as engineering apprentice (1887-90), with Ruston, Proctor and Co., Lincoln—this at an age when fingers are plastic and the constructive faculty to the fore. He then gained a National Scholarship at South Kensington and afterwards a Whitworth Scholarship, which enabled him to prolong his course of study. He was therefore able to devote himself to the scientific studies with a practical outlook and a more ripened mind than is usually found in the ordinary student of natural knowledge. His training was far wider and more illuminating than that of the professed student of engineering, who to-day is most narrowly educated; on the other hand, his training in engineering on the higher theoretical side was slight and he was without mathematical pretention. Had he been trained as an engineer, on present-day lines, he would never have been the common-sense chemical engineer he was. He was chemist at heart, which few engineers are or probably can be, on which account their services are often of limited value. Chemical engineers, of any worth, will certainly not be found to grow upon any tree; it must be a very limited profession. After all, the great fact to be recognised in these days is the impossibility of getting on without chemical feeling. Every engineer must in future be more of a chemist than engineers have been hitherto; on the other hand, every chemist should be in some measure an engineer, without aspiring to be hyphenated. Mrs. Hinchley's memoir is an important contribution to a pressing educational problem of the day, as well as a tribute of affection to a man who must have been a true helpmate and husband; in fact, they were an ideal couple.

Hull as a Chemical Centre

MOST of our staple industries have a recognised home. Sheffield, for instance, is inseparably associated with steel, Manchester with cotton, and Bradford with wool, but there is no single town which can claim a monopoly of chemical production. All our great centres of population have a considerable chemical trade peculiar to their local requirements. Industrial Lancashire is a great chemical centre, but what of Billingham, Nottingham the industrial outskirts of London, or the great towns of the West Riding of Yorkshire? Each area contributes to the general store of chemical products, but none can be regarded as the industry's headquarters quite in the same way as Luton is recognised as the headquarters of straw hat making. We are prompted to have reflections by a perusal of a new edition of "The City and Port of Hull," just issued by the Hull Development Committee. If Hull cannot be acclaimed as "the" home of chemicals it certainly ranks high among the chemical producing towns of England. Besides a substantial trade which can be regarded as purely chemical, it is "the chief centre of the seed crushing trade of the United Kingdom" (we quote from the book), "one of the largest and oldest centres in the world for the manufacture of all classes of paints, enamels, colours, polishes and stains" showing every sign of developing. The Hull factory for the manufacture of blues, starch and polishes is "a hive of industry where thousands of people are kept in steady employment" and "an increasing number of local people are being employed" in the production of soap. There is also at Hull a factory making disinfectants "capable of turning out several million gallons a year of disinfectants of various kinds, including highly refined medical, technical and industrial types."

One of the oldest established industries at Hull is that of the distilling of coal tar and by-products, one company having been in existence for over a hundred

years. The increasing use of petrol has opened up a comparatively new industry in petrol and spirits in the city, although some local refiners have been established over fifty years. Among other activities specially mentioned by the Development Committee, Hull is noted for its agricultural and fish manures, leather and tanning, glass bottle manufacture, tallows and greases, beverages and perfumes, and the production of cocoa butter. We doubt whether many other towns could boast of a more comprehensive list of industries in which chemicals play so intimate a part.

Liberty for the Trader

MR. CHAMBERLAIN made some very wise remarks at the Mansion House dinner at which bankers and merchants of the City of London were the guests of the Lord Mayor. In particular, he declared that the main principle of British policy was rather to increase consumption than to restrict production. It seems strange to be applauding a British Chancellor of the Exchequer for uttering what our fathers and grandfathers would have regarded as a truism verging on the commonplace. National policy, however, has gone through such an amazing transformation in the last few years with the introduction of subsidies, marketing boards, and quotas, as to make the harassed trader wonder where all this regimentation of his business affairs is going to end. Mr. Chamberlain did not gloss over the restrictive aspects of the Government's agricultural policy, but on the other side of the account he made several interesting claims. The level of our customs duties is low; we have an extensive free list; we make no discrimination between the goods of one foreign country and another; we impose no exchange control; and we have never placed a quota upon manufactured goods. It is well that other countries should be reminded that our protection is not their protection, but it is difficult to see how the trade barriers which Mr. Chamberlain deplores can be removed without the restoration of much more liberty to the individual trader than he now enjoys.

Another Synthesis

THE synthetic production of natural raw materials is one of the most fascinating studies of the chemist. The now hackneyed story of the elimination of the once profitable industry of indigo growing shows too clearly the detrimental effect that the chemist may have upon the work of the countryman. Synthetic production of any raw material is only economic from the world point of view when the natural material is poor in quality, is expensive in price, or is short in supply. Anything more than this is simply a form of that economic nationalism of which all economists are so anxious to see the end. One of the cheapest and most plentiful of natural raw materials is rubber, and yet, such is the pertinacity of the chemist, the problem of the artificial production of synthetic rubber has attracted the attention of inventors and research workers for many years. It is not denied that substitutes have been found which have proved cheaper, even if lacking to some extent in the valuable qualities of the natural article. If a tithe of the energy had been spent upon cheapening the cultivated article as in trying to replace it, there would surely have been no need to produce synthetic rubber. This statement is made in full knowledge of the valuable work that has been done by rubber organisations. In some countries, possibly Russia and certainly Germany, rubber synthesis has been stimulated by a reason not mentioned among the world reasons just given for replacing a natural article by a manufactured substitute. These countries own no rubber plantations and on account of their internal difficulties are unable to pay for the materials they need. The skill of the German chemist when working in teams is well known, and it was not surprising to hear some years ago that the Interessen Gemeinschaft were making good progress in this direction of supplanting rubber by an artificial product. Now a proclamation has just been made by Herr Hitler to the effect that "As the problem of producing synthetic rubber can now be regarded as definitely solved, the erection of the first factory in Germany for this purpose will at once be begun." Unlike the President of Poland, Hitler has no claim to be a chemist. He is compelled to believe what he is told! It may be that a reasonably efficient substitute has been obtained at a price which it is better to incur than to buy abroad rubber for which payment will one day be demanded.

The Brussels Exhibition

ELSEWHERE in this issue we refer at some length to the British Chemical Section of the Brussels International Fair which has now been running for five months and still has one more month to run. In arranging a comprehensive display of British-made chemicals without showing the name of a single firm or the name of a proprietary article anywhere in the exhibit, the Association of British Chemical Manufacturers' has effected a remarkable achievement. The British exhibit has received commendations from the chemical industries of other countries, some of whom are themselves showing at Brussels. What is even more to the point is that it has yielded a surprisingly large number of inquiries from potential buyers of chemical products, and the Association's staff both at the exhibition and at its own headquarters in London, has been kept busy dealing with the type of inquiry which discloses a genuine search for information of the kind that leads ultimately to the placing of orders.

The Association has issued an excellently prepared memorandum on the exhibit, primarily for record purposes and for the information of those members who have been unable to visit Brussels, showing precisely how the exhibit is laid out. In addition it has had photographs taken of the whole section, representing a fine pictorial record of a really successful enterprise. The Brussels Exhibition is, of course, a different thing from the British Industries Fair, where individual firms are anxious to show what they have to sell, but we are constrained to wonder whether something similar to the display at Brussels would not be to the general advantage of the chemical industry at Olympia next February. The chemical section at previous Fairs has not, in our view, "put across" the story of chemical production as it should have done. While new firms appear in the section from time to time, some of the oldest and largest have disappeared from Olpmyia in recent years, and it is possible that they could be persuaded to return if they could be assured that the interest of the buyers would be aroused as it has undoubtedly been at Brussels during this summer.

Work of the Government Laboratory

Annual Report Reveals Greater "Tax-Gathering" Activities

THE annual report of the Government Chemist upon the work of the Government Laboratory for the year ending March 31, 1934, (H.M. Stationery Office, price 9d.), states that the total number of samples examined in the course of the year, including those dealt with at the Chemical Stations, was 522,788, as compared with 503,592 in the preceding year, an increase of 19,196. The principal increases occurred in the number of samples of hydrocarbon oils, beer, wine, spirits, cocoa and chocolate, samples for duty under the Import Duties Act, 1932, Safeguarding of Industries Act, 1921, tobacco exportations, silk exportations, in samples of sugar composite goods and British sugar and in samples taken under the National Marking Schemes. The decrease in the number of samples examined at the Chemical Stations arises from the closing of Manchester Chemical Station, and the transfer of the examination of samples of tea to Tea Inspectors of Customs and Excise. There was a decrease in the number of samples examined for the Admiralty, Inland Revenue, Ministry of Health, Post Office and Fishery Board for Scotland, and fewer samples of imported spirits were examined.

Hydrocarbon Oils

The Hydrocarbon Oils Duty has involved the examination of nearly 17,000 samples for assessment of duty on importation, or drawback of duty on exportation, the increase in the number of samples being due to the duty of 1d. per gallon charged on oils other than light oils. The samples consisted largely of articles in which hydrocarbon oil was one of the ingredients and the quantity and character of the oil had to be determined. Many samples which are examined for oils may contain other dutiable substances, which must be tested for and determined, such as alcohol, esters and chemicals listed by the Board of Trade under Part I of the Safeguarding of Industries Act, 1921, and the specified items of the Ottawa Agreements Act, 1932. In addition to samples requiring examination under these Acts, 700 papers were submitted for elucidation of technical matters arising from the incidence of the duties. Further, some 3,700 or more were received in connection with technical problems of various kinds, mostly revenue subjects. While nearly 17,000 samples were examined solely for incidence of duties more recently imposed, many not shown separately in the total number of samples were also examined for specific and other older duties.

In recent years there have been very large increases in the quantity of alcohol used duty-free under the Finance Act, 1902, Section 8. The Board of Customs and Excise consult this Department on the various aspects of denaturing and uses of this important raw material of chemical industry. This growing use of duty-free spirits and industrial methylated spirit in the manufacture of a wide range of substances involves an increase in the consultative work of the Laboratory apart from the examination of samples to ascertain whether the conditions of use laid down by the Commissioners of Customs and Excise have been fulfilled. There has been an increase in the number of samples of tobacco and snuff examined in connection with payment of drawback on exportation, 97,255 compared with 84,312 in the previous year.

Food Products

The number of samples of cocoa, chocolate and wine submitted for examination was greater by some 1,400 than in the previous year. Samples of beer, imported and exported, submitted for test during the year increased by 1,609. Silk and artificial silk samples imported and exported increased by 1,866, and that part of the Laboratory concerned in the examination of silk was called upon to deal with the testing of other animal and vegetable fibres and hairs of all kinds, under the Import Duties Act, 1932.

Forty-six samples of condensed milk, including seven from Scotland and six from Northern Ireland, were sampled under the provisions of the Food and Drugs Act. These comprised sweetened and unsweetened milks and milk powders. The samples were examined with a view to ascertaining whether there was evidence of the removal of any of the normal constituents of milk other than water during the process of concentration, and, if so, whether the packages were marked to that effect. All samples were satisfactory. Premises on which butter is blended or re-worked or on which margarine is manufactured are inspected by officers of the Ministry of Agriculture, who are also empowered to take samples for analysis. Nineteen samples of margarine were taken. One sample contained 17 per cent. of water, an excessive proportion.

During the year two fertilisers, potato and turnip manures, and 15 feeding stuffs, meat meals, meat and bone meals, sow rations, cattle nuts, maize and linseed nuts, biscuit meal, broad brans and barley meal, grade II, were examined, two samples being received from sellers. Deficiencies or excesses beyond the limits allowed by the Regulations in oil, protein and/or fibre were found in all the feeding stuffs except the barley meal. The two samples described as "broad bran" were not entitled to be so named. The results obtained confirmed those of the agricultural analysts who had examined the samples in the first instance except in the following respects. The two fertilisers were not deficient in potash to an extent exceeding the prescribed limits of variation. The barley meal, grade II, contained approximately 10 per cent. of wheat, oats and weed seeds, but it could not be stated definitely that the article contained less than 90 per cent. of barley, the minimum proportion specified for this grade of barley.

Chemical Stations

In order to avoid delay in the examination of samples, Chemical Stations have been established at the more important seaports where certain classes of samples are tested. The Liverpool Chemical Station is in charge of two chemists drafted from the central staff and in close touch with the work at headquarters. The work at this station has been extended to embrace classes of samples not dealt with at other chemical stations. The Glasgow Chemical Station is in charge of a chemist drafted from the central staff in London and deals with all the Scottish Chemical Station work. The chemical station at London Dock forms part of the Custom House Laboratory organisation and is in charge of the Superintending Chemist of that Laboratory. The remaining chemical stations are under the general supervision of a member of the chemical staff of the central laboratory, who visits them periodically. As a further check on the work the residues from a certain number of samples tested at the chemical stations are retested at one of the central laboratories. The number of such retests during the year was 822. The results indicate that the work at the chemical stations is performed in a highly efficient manner.

Dangerous Drugs Act

Under the provisions of the Dangerous Drugs Acts, 1920-1932, the importation or exportation of prepared opium (that is, opium prepared for smoking purposes) is prohibited entirely. The Acts further make it an offence, *inter alia,* to import or export, except under licence and into or from ports approved by the Commissioners of Customs and Excise, raw opium, Indian hemp and coca leaves. The importation or exportation except under licence of a number of habit-forming drugs, and derivatives and preparations containing these drugs is also prohibited. In suspected cases the Officers of Customs and Excise sample the goods and the samples are examined here; 55 samples were received, and of these one consisted of opium dross, and three medicinal preparations contained more than one-fifth of 1 per cent. of morphine. Fifty-one samples of imported colouring materials were examined to ascertain whether they contained synthetic organic dyes, the importation of which under the Dyestuffs (Import Regulation) Acts, 1920 to 1934, is prohibited except under licence.

During the past year 10,402 samples were examined in connection with the Safeguarding of Industries Act, including 51 samples which were examined both for dyes and liability to Key Industry Duty. The object of the examination in most cases was to ascertain (*a*) whether the product was such as to come within the class of those liable to duty; or (*b*)

whether, in the case of the substances such as medical preparations bearing trade names without disclosure of their ingredients, the imported article contained any substance liable to duty, and, if so, in what proportion. Fifty-one of the samples were examined in connection with claims for drawback of duties on exportation.

Wood spirit, which consists mainly of methyl alcohol and synthetic methyl alcohol, is not liable to spirit duty on importation unless it is purified so as to be potable, in which case it is charged as ordinary spirits (Spirits Act, 1880). Synthetic methyl alcohol is in any case liable to Key Industry Duty. Of 49 samples of imported methyl alcohol, four were found liable to duty on the grounds of potability. Fusel oil, which consists largely of propyl, butyl and amyl alcohols, is by-product in the manufacture of ethyl alcohol, and is of considerable commercial importance as a raw material for the manufacture of solvents for lacquers, varnishes, etc.

Whether imported or home produced it generally contains ethyl alcohol as an impurity, but duty is not charged on such ethyl alcohol unless upwards of 15 per cent. of proof spirit is present. Twenty-eight samples were examined for this purpose.

Thirty-five samples of fusel oil from British distilleries were examined. Of these, four were found to contain more than 15 per cent. of proof spirit, and delivery out of Revenue control was refused until the proportion of spirit had been reduced.

Preparations Containing Sugar

Sugar is ordinarily assessed for duty on importation or on delivery from a beet-sugar factory, as well as for repayment of duty (drawback) on exportation, in accordance with its polariscope reading by the scales prescribed in the Finance Acts, 1928 and 1932. Glucose, molasses, saccharin and other sweetening agents, as well as articles containing them, are also examined to determine their rate of duty. Glucose is largely used for brewing purposes, and in confectionery; molasses enters into the composition of cattle foods, sauces and dye-wood extracts, and is employed in the manufacture of spirits. As a synthetic sweetening material, saccharin is frequently substituted for sugar in the manufacture of table waters and in the preparation of foods for diabetic persons. The variety of preparations containing sugar is so great that it has been found necessary to adopt fixed rates of duty in the case of those which are regularly imported and fixed rates of drawback for exported preparations, samples being examined only in cases of doubt as to their description or rating for duty purposes, and occasionally as a check on the fixed rate. There are, however, many articles for which it is not practicable to fix a special rate of duty, and these have, consequently, to be tested on each importation, or where repayment of duty is claimed. Among the articles sent for test were biscuits, canned fruits, condensed milk, liquid eggs, fruit juices, tanning extracts, sauces, ketchups, confectionery, jams, syrups, ginger, canned vegetables and soups, and cereal foods. It has been necessary to subject a number of these to further examination in connection with the general Import Duties of the Ottawa Duties. The number of samples of sugar and articles containing sugar or other sweetening matter examined for assessment of duty or drawback was 71,516, as compared with 70,852 in the preceding year.

Glucose and Saccharin

In connection with the assessment of duty on British-made glucose, 269 samples were taken during the course of manufacture; 683 samples were examined for assessment of drawback on exportation, and, in addition, 83 samples of imported glucose and of glucose used in syrups made at sugar refineries.

Seventy samples of imported substances were specially examined with this object, and in a large proportion saccharin was present. Most of the samples contained some other dutiable ingredient, such as sugar, spirit or chloroform, and this has also to be determined. Seven hundred and twenty-one samples of saccharin and articles containing saccharin were examined for the purpose of assessing the amount of drawback payable on exportation, and 90 samples of saccharin and of the materials used in its production were likewise examined in connection with the assessment of duty on saccharin manufactured in this country.

Samples of beet-pulp, beet juice, molasses and refined sugar, 5,069 in number, were examined in connection with the manufacturing operations, and for assessment of the duty to be charged and the subsidy to be paid.

One hundred and eleven samples of condensed milk were taken by Customs Officers from imports under the Public Health (Condensed Milk) Regulations, which require that condensed milk shall contain not less than the following proportions of milk solids, including fat: Whole milk, sweetened or unsweetened, 31 per cent. of milk solids including 9 per cent. of fat; skimmed milk, sweetened, 26 per cent. of milk solids; skimmed milk, unsweetened, 20 per cent. of milk solids. Nine samples were reported against. In seven cases the offence was connected with the labelling, and in two cases the statement of the quantity of whole milk to which the contents of the tin were supposed to correspond was incorrect, the actual quantity being over-stated.

The Public Health (Preservatives, etc., in Food) Regulations, which have been promulgated in similar terms for the most part by the Ministry of Health, by the Scottish Board of Health and by the Ministry of Home Affairs for Northern Ireland, prohibit the sale of articles of food containing preservatives, except in the case of a few foods and beverages, in which certain preservatives are allowed to a limited extent, in some cases under certain conditions as to marking. They also prohibit the sale of food containing certain colouring matters, and the sale of cream which contains any thickening substance. The regulations further do not allow the importation of articles of food which contravene these requirements.

The administration of the Regulations within the country is in the hands of the local authorities administering the Food and Drugs Acts, who also, in conjunction with Port Sanitary Authorities, undertake the examination on import of such goods as meat, fish, and fresh fruits, as to their conformity with the new requirements. All other imported foods are sampled by Officers of the Board of Customs and Excise, the samples being forwarded for examination at the Central Laboratories or at the Liverpool Chemical Station.

Other samples examined for the Ministry of Health: fruit in pulped condition for jam-making, and canned drained and dried fruit, vegetables in brine and canned vegetables, sugar and molasses, wine and beer, fruit juices, syrups and cordials, chocolate, gelatine, butter, cream, margarine, condensed and dried milk, cornflour and pearl barley.

Charcoal Fuel for Cars

Italy Anticipates a Shortage of Petrol.

MUCH attention has been devoted in Italy, in recent months to the search for substitute fuels which might take the place of imported oils and petrol, and an interesting experiment arranged by the Italian Automobile Club ended in Rome last week. A sports car, with its engine adapted for the use of charcoal fuel, reached Rome after a rapid tour of Europe, in which Vienna, Budapest, Warsaw, Berlin, Amsterdam, Brussels, London, and Paris were visited. It was accompanied by a control car throughout the journey. The distance covered was about 3,750 miles in 11 days, or an average of some 340 miles a day. It is stated that no trouble was experienced and that high average speeds were maintained. One ton of charcoal was consumed, the cost of which is given as roughly 180 lire, or just under £3, a great saving on the price of petrol for a similar journey, estimated at from 12 to 15 times as much as was spent on the charcoal fuel. Charcoal, moreover, possesses the further advantage of being an Italian product.

Former experiments of the same kind led to a trial of the charcoal-burning engine on the public omnibus services in several large towns. The results have apparently been so satisfactory that the Government were led to decree at the recent Cabinet meeting at Bolzano that all vehicles used for passenger transport must be adapted for the consumption of charcoal fuel by December 31, 1937. It is estimated that 10,000 vehicles will be affected, and, as a result, a large drop in Italian imports of motor-fuel is expected.

IMPORTS of aromatic chemicals into all Japan during the first quarter of 1935 amounted to 1,818 lb., valued at 10,120 yen, as compared with 8,489 lb., valued at 36,476 yen, during the same period of 1934. Imports of aromatic chemicals are not shown according to countries of origin in the returns of the Imperial Japanese Customs, but France, Germany and Great Britain supply practically all of such imports.

Economics of the Synthetic Manufacture of Ammonia—I

Cyanamide, Arc and Haber Processes

These notes were originally compiled in 1918, with the object of providing information necessary to decide whether it would be advantageous to manufacture ammonia synthetically as a commercial proposition in England. They are now published in the hope that they will prove useful to young chemical engineers, in showing the details involved in the preparation of such a scheme. The nitrogen fixation processes considered are those known as the Cyanamide, Arc and Haber processes.

THE manufacture of cyanamide consists essentially of:—(1) The production of power; (2) the manufacture of carbide from lime and coke or anthracite; (3) the separation of nitrogen from air; (4) manufacture of cyanamide from carbide; and (5) after-treatment of cyanamide to remove impurities and to make it suitable as a fertiliser (or alternatively its conversion to ammonium sulphate).

1. *The Production of Power.*

The following are given as the requirements of power for the various processes:—

Carbon production	9.5 × 0.8 =	0.4
Nitrogen production		0.07
Cyanamide production		0.06
Total per ton of cyanamide		0.55 K.W.Y.

The cost of power will, of course, depend on the way in which it is raised. At the average Norwegian power rates, *viz.*, £2 K.W.Y., the cost would be £1.06 per ton of cyanamide. At best possible rates for steam raised from coal, *viz.*, £3.75 per K.W.Y., the cost would be £1.98. At 0.2d. per K.W.H. the cost would be £3.75.

2. *The Manufacture of Carbide.*

Quantities per 1 ton of carbide:—

Lime (good quality)	0.95 tons
Anthracite or coke	0.62 tons
Electrodes, about	0.025 tons
Energy	0.5 K.W.Y.

(Capital cost, say, about £3 per ton per annum).

On this basis the report of the M.I.D. gives the following costs of production per ton of carbide:—

Lime at 15s. per ton	£0.712
Anthracite at 16s. per ton	0.496
Electrodes at £15 per ton	0.375
Repairs	0.266
Labour, etc.	1.087
Depreciation at 8 per cent.	0.240
Interest on capital at 5 per cent.	0.150
Total per ton of carbide	£3.286

It is necessary to modify this estimate as the basic costs are not likely to be realised. Lime is now about 35s. per ton, though it may come down to say about 20s. per ton. Anthracite cannot be put at much less than 30s. per ton. Electrodes are costing about £50 per ton, but this figure could probably be reduced to about £20 to £25. Labour rates are about doubled.

The quantities of materials consumed, given above, agree approximately with those obtained from America and Italy, and the estimate is fairly conservative. Taking lime at 20s., anthracite at 30s., and electrodes at £25, and making allowance for present labour rates, the probable cost per ton would be slightly over £5 for a large-scale plant of over 20,000 tons capacity per annum. (A recent estimate of war prices in England on a small plant gives £11 5s. per ton.)

3. *Separation of Nitrogen from Air.*

The costs of the separation of nitrogen from air by the "Claude" process, which is the process in most general use, can be given as follows:—

Labour	0.523d.
Materials (lime, etc.)	0.350
Upkeep	0.306
Amortisation	1.881
Total per 1,000 cu. ft.	3.06d.

1.43 tons of nitrogen = 1 ton of fixed nitrogen = 5 tons of cyanamide: therefore costs of nitrogen per ton is

$$\frac{3.06 \times 385 \times 2240 \times 1.43}{1000 \times 28 \times 5 \times 240} = £0.11.$$

4. *Manufacture of Cyanamide from Carbide.*

This can either be carried out in a continuous manner in a "Carlson" furnace or by the discontinuous process. The "Carlson" process is said to be about 20 per cent. cheaper than the discontinuous process, and the consumption of carbide and labour costs are less. The French, on the other hand, have not found [illegible] for believing that the costs are not very different. Taking the case, therefore, of a discontinuous plant, the costs may be given as follows:—

Electrodes, Labour, Repairs, Expenses	£1.22
Depreciation 8 per cent.	0.36
Interest 5 per cent.	0.20
Total per ton of Cyanamide	£1.78

5. *After-Treatment of Cyanamide, etc.*

Cyanamide, for the purposes of fertilising, must contain as little as possible of carbide, phosphide and hydrate of lime. These are removed by treatment with water. The final product contains 17 per cent. of nitrogen. The cost of such after-treatment is stated to be about £0.2 per ton. If the cyanamide is subsequently converted to ammonium sulphate it has to be heated in autoclaves with steam and then the ammonia produced fixed with sulphuric acid. We shall not consider this point, as it will obviously be more favourable to the cyanamide process to compare the costs of the nitrogen content of cyanamide with the market price of ammonium sulphate, than to compare the cost of the ammonium sulphate produced from such cyanamide.

On the basis of these figures taken from the M.I.D. report, and taking 0.8 ton of carbide as equivalent to 1 ton of 20 per cent. cyanamide, we have:—

Carbide	3.286 × 0.8 = 2.62
Nitrogen	0.11
Cyanamide conversion	1.78
After-treatment	0.20
Total per ton of Cyanamide	£4.71

This is on the basis of pre-war prices and it is probable that increase of at least 30 per cent. must be allowed for the future. The total minimum cost of cyanamide would then be, say,

£7 10 0 per ton.

This is equivalent to:—

$$\frac{91}{83} \times 7.5 \times \frac{20.5}{1.7} = £10$$

reckoned as ammonium sulphate containing an equivalent amount of nitrogen. The relative fertilising value of ammonium sulphate and cyanamide is as 91 is to 83. This figure is about the lowest value at which cyanamide could be marketed. It assumes that the Norwegian companies can obtain anthracite at 30s. per ton shipped to Norway and lime at 20s. per ton. The shipping freights of cyanamide are also not included.

For cyanamide production in this country there would be about an additional £1 on the cost of the cyanamide for power, or £8 10s. per ton. The cyanamide produced in England would therefore hardly compete with that produced from water power in other countries, and could not be produced at sufficiently low a price to afford profit in comparison to the prices obtaining for Chile nitrate and ammonium sulphate. For, in order to compare satisfactorily with nitrate at £11 or ammonium sulphate at £13 2s. per ton, cyanamide would have to be sold at

$$\frac{£11 \times 15.65 \times 83}{17 \times 100} = £8.8 \text{ per ton.}$$

The outcome of this discussion is that the cyanamide process produced from water power in countries like Norway can compete to some extent with Chile nitrates, but that such competition could not be maintained by cyanamide produced in England by power from coal. A better utilisation of the power could hardly lower the total cost of production more than about 20 per cent. and the prospects of profitable manufacture must be rather looked for in the direction of obtaining cheaper lime, anthracite or coke.

The Arc Process

It appears to be quite clear that this process is only useful as a means of fixing nitrogen where very cheap power can be obtained; the utilisation of the power being so exceedingly inefficient that only 3 to 4 per cent. is utilised in effecting the combination of the nitrogen and oxygen of the air. The capital cost of the plant is also large on account of the low percentage of the nitrogen oxides in the issuing gases which have necessitated the installation of very large absorption towers. For production of fertilisers, it is usual to neutralise the nitric acid produced with lime and so obtain a basic calcium nitrate.

From the costs given in the M.I.D. report with water power at *cheapest* Norwegian rate (0.03 per K.W.H.), sodium nitrate would be about £6 5s. 0d. per ton. With steam power at cheapest rate (0.108d. per K.W.H.), sodium nitrate would be about £10 per ton (soda ash is taken at about £3 per ton). These figure are given in terms of sodium nitrate so as to compapre with Chile nitrate. The nitrogen fixed in Norway by the Arc process can probably compete with the nitrogen fixed as cyanamide, though from a given capital expenditure the output would be lower. In England, on the other hand, the Arc process could at best hardly hold its own against imported nitrogen. The process could only be considered from the point of view of production of strong nitric acid, for which the demand is very limited.

The main objection is the low output per electric h.p. To produce an equivalent of 100,000 tons of sodium nitrate per annum would require about 170,000 h.p. The cost of the power is about 75 per cent. of the total cost of production (in terms of nitric acid). If the efficiency of the process could be largely increased there might, of course, be a future for the process.

Ammonia Synthesis (Haber Process)

In the Haber process hydrogen and nitrogen have first to be produced and then they are compressed at a high pressure and circulated over a catalyst at a temperature about 600° C. The small percentage of ammonia produced in the gas issuing from the catalyst is removed either by solution in water or by refrigeration, the ammonia being subsequently combined with sulphuric acid to produce ammonium sulphate. Other fertilisers can be produced by absorption of the ammonia in other reagents.

The process divides itself into (1) the production of power for compression of the gases, and heating of the gases in the bomb's or catalyst furnaces; (2) production of nitrogen from air; (3) catalysis and removal of ammonia; and (4) fixing of the ammonia in sulphuric acid, etc.

The economy of the process depends mainly on (a) cost of production of hydrogen; (b) the efficiency of the heat interchange in the high pressure system; and (c) the activity of the catalyst.

It is not possible closely to estimate the cost of production of ammonium sulphate in this manner without going into every detail of manufacture, as no plants outside Germany are in operation, but certain assumptions can be made, and on the basis of these the efficiency of the process can be safely judged. From the work that has so far been done, it is probably safe to assume the cost of hydrogen will be less than 3s. per 1,000 cu. ft. inclusive of all charges (cost at 20s. per ton), from which taking 1.17 mols. of ammonium sulphate equivalent to 4.62 of hydrogen, 1 ton of ammonium sulphate is equivalent to

$$\frac{4.62 \times 2 \times 2240 \times 385}{1.17 \times 132 \times 2} = 25{,}600 \text{ cu. ft. of hydrogen}$$

$$= \frac{25{,}600 \times 3}{1{,}000} = £23\ 17\ 0 \text{ per ton of ammonium sulphate.}$$

The nitrogen can be produced practically for nothing if it is made along with the hydrogen and the above costs of 3s. per 1,000 cu. ft. of hydrogen would include the cost of the necessary nitrogen. For purposes of estimate, however, we could assume that the nitrogen was made separately by liquefaction by the "Claude" process. As

$$\frac{25{,}600}{3} = 8{,}500 \text{ cu. ft.}$$

are required per ton of ammonium sulphate, and assuming the cost of production to be 10d. per 1,000 cu. ft. (which is a high figure), the total cost would be

$$\frac{8.5 \times 12}{12} = \text{say, 7s. per ton of ammonium sulphate.}$$

Power Requirements.

The power for heating gases in the bomb for production of 125 lb. of ammonia per hour is about 70 K.W. Assuming that a plant produces 90 tons of ammonia per day = 340 tons of ammonium sulphate per day, 3,825 K.W. would be required, *i.e.*,

$$\frac{3{,}825 \times 24}{340} = 271 \text{ K.W.H. per ton of ammonium sulphate.}$$

The power for circulation of the gases would be about 800 K.W. for the same production, *i.e.*,

56 K.W. per ton of ammonium sulphate.

The power for compression of 11,380,000 cu. ft. of gas ($N_2 - 3H_2$) from 1 atmosphere to 150 atmospheres per 24 hours in four stages would be

3,456 h.p. or 183 K.W. per ton of ammonium sulphate.

The power for removal of the ammonia by partial refrigeration and partial solution in water would be about 105 K.W.H., consequently the total power costs per ton of ammonium sulphate would be:—

For heating	275	K.W.H.
For circulation	56	,,
For compression	185	,,
For refrigeration, etc.	105	,,
Total per ton of ammonium sulphate	611	,,

i.e., at 0.25d. per unit = 617 × 0.25 = 155d. = 13s. per ton of ammonium sulphate.

Cost of Conversion.

The cost of conversion of ammonia to sulphate inclusive of the cost of sulphuric acid may be taken as £1.8 per ton of sulphate. Assuming that a plant for the production of 340 tons of ammonium sulphate per day would cost £1,000,000 without the hydrogen plant the interest at 5 per cent. would amount to £0.42 per ton:—

Interest	5 per cent.	£0.42
Depreciation	10 per cent.	0.84
Repairs	10 per cent.	0.84
Labour	1 per cent.	0.084
General charges	5 per cent.	0.42
Total per ton of sulphate		£2.604

Summarising the costs of production we have:—

Hydrogen	£3 17 0
Nitrogen	7 0
Power	13 0
Interest on capital, etc.	2 12 0
Total	£7 9 0

to which should be added:—

Cost of acid and conversion to sulphate, say	1 16 0
Total per ton of sulphate	£9 5 0

This rough but liberal estimate shows that ammonium sulphate can certainly be produced by the Haber process at *less than £10 per ton* in England, assuming prices of coal to be about 20s. per ton and power at about 0.25d. per K.W.H. It is probable that very considerable reduction in the cost could be made and that with a large scale plant it would be reasonable to expect a cost of production as low as £7 per ton.

The Haber process starts with coal from which gas, by-products and coke can be obtained. The power can be derived from the gas and the coke will provide the hydrogen, the necessary steam being obtained from waste heat in the process. The nitrogen can be produced at the same time. The process is thus self-contained, coal being the single raw material. One ton of coal going in at one end of the fac-

tory would come out as close on 1 ton of ammonium sulphate. In principle, therefore, the process is exceedingly economical. In practice there are certainly difficulties, as high pressures and very pure gases have to be produced, but experimental work has been carried forward far enough to show that these difficulties are all surmountable.

A price of £9 5s. per ton of ammonium sulphate is equivalent to a price of £7 14s. for Chile nitrate, while a price of £7 is equivalent to only £5 18s.

It is possible, therefore, to produce in England ammonium sulphate by the Haber process in competition with imported Chile nitrate and to compete satisfactorily with other fixation processes utilising cheap water power in countries where such can be obtained. The process cannot, of course, compete against by-product ammonium sulphate, as regards cost of production.

The foregoing discussion is summarised in the following table:—

Source	Estimated minimum production cost per ton of material	Equivalent to per ton of combined nitrogen
Chile nitrate (natural)	say, £7	£45
Ammonium sulphate (by-product)	say, £5	£24 6s.
Cyanamide (Norway)	say, £7 10s.	£37 10s.
Sodium nitrate (Arc process Norway)	say, £6 5s.	£41 10s.
Ammonium sulphate (Haber process)	say, £7	£34

Fuel Requirements.

As coal is the main national asset its use should be restricted so as to ensure of its being used in the most economical manner. To raise power from coal to fix 1 ton of nitrogen would require:—

By the Arc process, at least 53 tons of coal.
By the Cyanamide process, at least 14 tons of coal.
By the Haber process, at least 1.5 tons of coal.

In the case of the Cyanamide process there is an additional 2.25 tons of anthracite or coke, and coal for burning lime 0.83 ton. In the Haber process, coke required for the production of hydrogen per 1 ton of nitrogen combined would be equivalent to about 5 tons of coal (economies can be made by utilising the gas from the coking of coal for the raising of the power needed in the rest of the process).

To win the material and carry to Europe 1 ton of nitrogen in the form of Chile nitrate requires about 2.8 tons of coal. It requires about 1 ton to win and evaporate 1 ton of nitrogen in the form of nitrate and about 1.8 tons to bring it to Europe, assuming 2 tons of coal to be burnt in a ship of 5,000 tons steaming at about 10 knots, the journey being about 7,000 miles.

To obtain 1 ton of nitrogen as ammonium sulphate as a by-product requires 435 tons of coal in the case of coke ovens and about 120 tons of coal in the case of producers.

Summarising these fuel requirements we have:—

Arc Process	53	tons coal.
Cyanamide Process	17	,, ,,
Haber Process	6.5	,, ,,
By-Product Sulphate	120-435	,, ,,
Natural Nitrate	2.8	,, ,,

The Development of Zirconium and its Compounds

By M. SCHOFIELD, B.Sc., A.I.C.

ZIRCONIUM was isolated more than a century ago, but although zirconium minerals are well distributed the metal itself has not attracted much attention until recent years. Zirconia, the dioxide of the metal, however, has been in use for a number of years, although difficulties in purification prohibited a wide use until its value as a refractory became realised. To-day, this lack of applications is being cancelled with electrolytic methods for producing the metal and more convenient processes for obtaining the dioxide.

Zirkite, which occurs in Brazil and contains up to 85 per cent. of the dioxide, may be either fused with alkali or digested with concentrated sulphuric acid as a first step towards production of the pure oxide, the metal being obtained by electrolysis of the oxide dissolved in molten salts. The fusion process seems to be losing favour, although in dealing with the silicate zircon fusion is more convenient, since 90 per cent. purity is claimed for the oxide formed by precipitation from an aqueous extract of the melt. A few years ago the Westinghouse Lamp Co. protected a process for treating this silicate in an entirely new manner, *viz.*, by fusing with coke, graphite or charcoal at temperatures up to 2,500° C., whereby silicon carbide and zirconium carbide are stated to be formed Digestion of the product with nitric acid gives zirconium nitrate. The United States Bureau of Mines has given preference in the case of processes for treating zirkite to the digestion method involving the use of sulphuric acid under pressure, the resulting solution being then hydrolysed to precipitate zirconia. An alternative is to fuse with an acid sulphate rather than with acid potassium fluoride, nitre, or with sodium fluoride plus caustic soda, as is given in some patents. In fusing with soda one protected method claims success with a furnace lined with zircon on the lines of a self-lining alundum furnace, the melt being discharged directly into water.

Zirconia is a refractory of supreme value. Its high melting point (2,950° to 3,000° C.) and great resistance towards acids and alkalis, together with its ability to undergo sudden changes of temperature without fracture, its low thermal conductivity, and high durability, explain the attention being given not only to zirconia bricks in place of magnesite bricks but also to linings and refractory articles made from it. Combustion tubes constructed of the oxide, and coatings prepared by use of a binding agent containing sodium silicate, aluminium and magnesium compounds, etc., have already appeared.

The Carborundum Co. have introduced a process for preparing zirconium compound rafractories by fusing zirconium sand in the electric furnace, roasting to 1,500° C. in an oxidising atmosphere, bonding with 5 per cent. alumina or a fused mixture of zirconia and titania, and firing at 1,500°. The Deutsche Gas Glühlich-Auer Gesellschafff have protected dense, solid articles compounded of zirconia and magnesia; other concerns claim success by mixing zirconia with a hydrolysable salt of zirconium, aluminium or magnesium, adding water to give a plastic mass, and firing the shaped article. Moulding under great pressure without the addition of any agent other than water is yet another method of preparing refractory articles, although some manufacturers prefer to include a little starch together with the hydroxide of zirconium in the mixture. One example which illustrates the high refractory powers of zirconia is in the Drummond light, where the oxide replaced lime; a further comparable application was in the Nernst lamps, in which the refractory employed was composed of 85 per cent. zirconia and 15 per cent. ytrium oxide.

Zirconia of 99 per cent. Purity.

Recently the I.C.I. concern has introduced a method of preparing zirconia of 99 per cent. purity by fusing zircon with caustic soda or sodium carbonate, the residue being dissolved in oleum. By dilution the various simpurities are removed, kieselguhr being used to assist the separation of these by filtration, and the zirconium hydroxide then precipitated by means of alkali is ignited to give the pure zirconia. Zircon for the production of the refractory can be separated from the sands accompanying it by a flotation process using pine oil together with a small amount of sodium oleate.

In addition to its refractory applications zirconia has entered other fields. In the glass industry it is applied as refractory in glass-melting furnaces. It has also been used as clouding agent in place of stannic oxide, although zirconia is not an opacifying agent in glasses which do not

contain alumina or zinc oxide. The greatest opacity is obtained when 15 per cent. of zirconia plus from 3 to 6 per cent. of other zirconium compounds are included. In the finishing of enamels it gives brilliance and opacity, the amounts used in iron enamels being round about 10 to 11 per cent. This application means a more expensive product, but the high opacity and increased mechanical strength and resistance towards chemical disintegration more than compensates for this higher price. Special porcelains for the electrical industry have been produced in which quartz is replaced by zirconia, the increased electrical resistance and ability to withstand sudden temperature changes being the advantages. The addition of zirconia in the manufacture of porcelain crucibles increases the durability. The possibilities of zirconia as a catalyst have not yet been fully explored to lead to its adoption on any large scale. In the rubber industry it may yet find some application as a filler in order to impart exceptional resistance to wear.

Turning to the metal itself there have been a number of processes for producing it from the oxide. The use of calcium for displacing zirconium from a mizture of zirconia and calcium chloride was protected in a process of the Westinghouse Lamp Co., the mass being heated in an iron-chromium-nickel alloy vessel. By extraction with dilute acid a coarse zirconium powder results, this being washed, dried, pressed into bars, degasified, and the bars forged at 900° C., after which follows a swaging and rolling process comparable to the treatment of tungsten and tantalum. The use of aluminium was the first step towards a more practical extraction process, although the product was contaminated with up to one per cent. of aluminium; even when magnesium was tried there was a similar difficulty in that a small proportion of unchanged oxide remained in the zirconium. In America a proportion of potassium chlorate in the charge has been claimed to cancel the objection to the use of aluminium. Electrolytic processes using fused salts as electrolyte came next. The Westinghouse Co. introduced a process in which the double fluoride of zirconium with potassium dissolved in a melt of sodium and potassium chlorides was contained in a graphite crucible at temperatures from 600° to 800° C., a molybdenum strip being the cathode.

Zirconium metal is silvery-white, very hard and greatly resistant to atmospheric corrosion. It forms alloys with all metals other than tin and lead, the ferro-alloy being applied in the United States as a cleanser in steel casting. In high-speed steels containing tungsten and chromium the inclusion of zirconium is claimed to prevent loss of hardness when the metal is used at high temperatures. There is also an increase in strength in armour-plate containing 0.34 per cent. zirconium with 3 per cent. of nickel, this being the proportion adopted by French armour-plate manufacturers. Zirconium-nickel-silicon-iron alloys containing 2.7 per cent. of zirconium have been introduced in the United States as resistant media towards hydrochloric and sulphuric acids. The possibilities of zirconium compounds as mordants, weighting agents, in X-ray examinations of the stomach, and as pyrophoric powders may be mentioned as evidence of the coming of zirconium into commerce.

Continental Chemical Notes

Belgium

THE MANUFACTURE OF PAINTS is to be undertaken by the firm of Dutron Frères et Soeurs at a factory in Marsinelle.

Italy

NEW PROCESSES HAVE BEEN DEVELOPED in Italy which enable appreciable quantity of hydrogen, nitrogen, methane and helium to be isolated from natural gas.

Germany

CRUDE TARS OR PETROL CAN BE REFINED by successive treatment with chlorsulphonic acid and fuming sulphuric acid. After separation of the acid reaction products, the residue is washed by the usual methods, dried and treated with decolorising agents. (German Patent 605,802).

ON EXTRACTING SPINDLE OIL of American origin with liquid sulphur dioxide, according to the Edelanu process, Zerbe and Folkens ("Brennstoff-Chem.," 1935, No. 9) obtained an extract consisting mainly of aromatic substances. Vacuum distillation yielded a large number of fractions, the compositions of which were deduced with fair accuracy by spectrographic examination. The fraction distilling between 260 to 300° C. contains 60 to 80 per cent. of naphthalene derivatives; the 300 to 350° C. fraction contains, in addition to naphthalenes, increasing quantities of phenanthrene derivatives; only a small quantity of naphthalenes appears in the 350 to 370° fraction where phenanthrene derivatives predominate; the final fraction (370 to 400° C.) contained an even higher proportion of phenanthrenes.

Russia

INDUSTRIAL EXPLOITATION OF LARGE FLUOSPAR DEPOSITS in the Soviet Union (near Amderma on the Kara Sea) has been commenced and an output of 10,000 tons is expected to be reached this year.

THE MANUFACTURE OF WATERPROOF FABRICS for the motor car industry and of waxed cloth for medicinal purposes is reported to have been started at the "Proletarskij Trud" factory in Leningrad.

LOPARITE DEPOSITS located near the Murman Railway are reported to contain as much as 12 per cent. tantalum and niobium as well as up to 35 per cent rare earths. According to "Chemische Industrie," however, extraction of these two metals is not practicable at the present time in Russia.

Holland

IN THE COURSE OF A SPEECH on the occasion of the establishment of the State Metal Commission, the Minister of Economics touched upon some recent industrialisation projects. These include an aluminium factory in the province of Limberg, where both bauxite and electrical power are available on favourable terms. Consideration is also being given to the production of certain light metals such as magnesium and beryllium.

A Plastics Agreement

I.C.I. Contract with an American Firm

AN international agreement in the plastics field is revealed in the announcement of the signing of a ten-year contract between Imperial Chemical Industries, Ltd., and Toledo Synthetic Products, Inc., Toledo, United States.

The agreement refers to moulding compounds and laminated compounds made from urea formaldehyde resins or urea thiourea formaldehyde resins. Under the agreement the concerns involved have contracted to exchange all technical, commercial, and other information relating to the agreement products and processes, and have agreed also to grant each other free licences under their patents which already exist, or which they may secure during the life of the contract.

German Exports of Essential Oils.

EXPORTS of essential oils from Germany during 1934 were valued at only 3,316,000 reichsmarks as against 11,442,000 during 1929. Exports for the first four months of 1935 were valued at 1,200,000 reichsmarks as against 1,084,000 for the equivalent period of 1934. The decrease in volume from 1929 to 1934 amounted to 60 per cent., or from 1,039 to only 413 tons. There were only 128 tons exported during the first four months of 1935 as against 140 for the similar period of 1934. The greater part of Germany's essential oil exports are taken by European countries. Overseas countries that are also important markets include the United States, British India, China, Japan and Brazil. Exports to the United States have fluctuated considerably from year to year.

British Chemicals at an International Exhibition

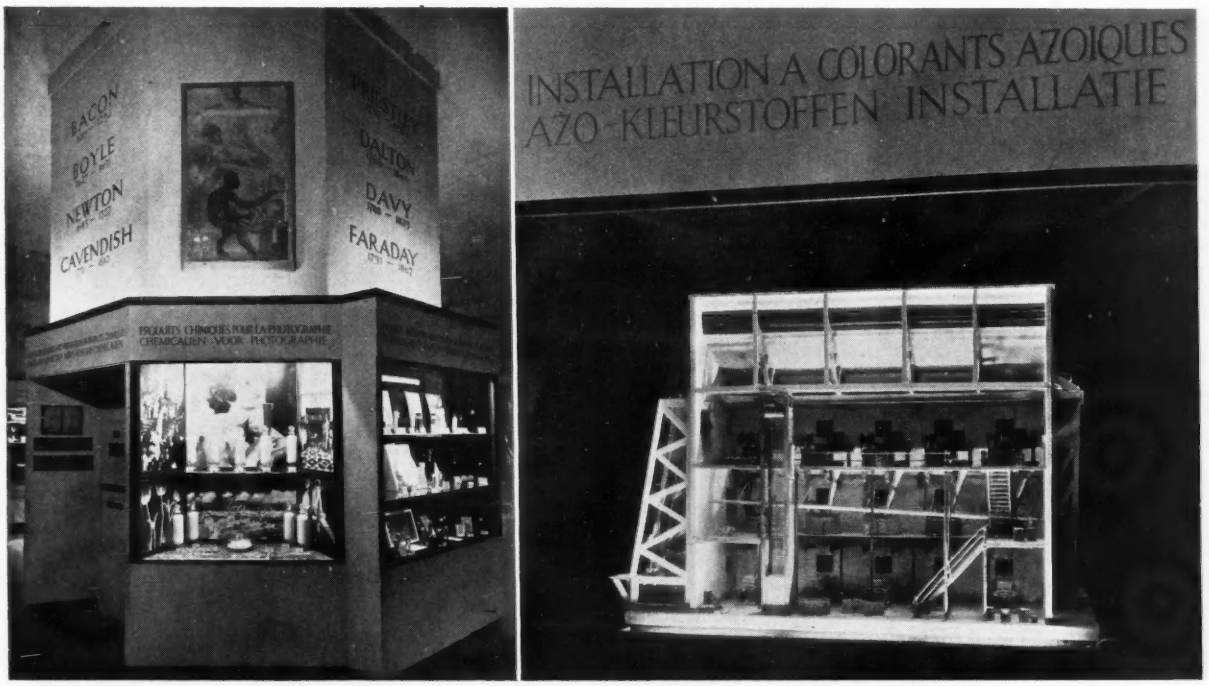
Unique Display at Brussels

WORLD-WIDE interest has been aroused in British-made chemicals by the British Chemical Section of the Brussels International Fair which opened in April and will close on November 5. Organised by the Association of British Chemical Manufacturers, the section is unique in that no names of firms or proprietary names appear anywhere in the exhibit. The area of the exhibit is in the form of a square. In the centre is an octagon, with three bays on each side, separated by a passage-way from the octagon and linked to the corresponding faces of the octagon by distinctively-coloured rubber flooring. The Association's office is inside the octagon, the lower half of which is devoted to showcases, except for the side facing the main entrance, which is the door of the office. The top part of the octagon has four alternate faces occupied by symbolic paintings, as follows: Fertilisers—The Work of Science Personified (shown opposite the agricultural chemicals); Dyestuffs—Coal as the Source of Colours (shown opposite dyestuffs and allied products); Chemicals—The Foundation of the World's Industries (shown opposite the heavy chemicals); and Paints and Lacquers—Protective and Attractive (shown opposite the fine chemicals).

On the four faces alternating with the paintings are the names and dates of sixteen distinguished British chemists, four on each face, starting with the side facing the main entrance, as follows: Bacon (1214-1292), Boyle (1627-1691), Newton (1643-1727), Cavendish (1731-1810), Priestley (1733-1804), Dalton (1766-1844), Davy (1778-1829), Faraday (1791-1867), Graham (1805-1869), Playfair (1819-1898), Frankland (1825-1899), Crookes (1832-1910), Roscoe (1833-1915), Perkin (1838-1907), Dewar (1842-1923), Ramsay (1852-1916).

The six main bays are allocated as far as possible to the following sections of the chemical industry: Fine chemicals, pharmaceutical chemicals, heavy chemicals, dyestuffs and allied products, coal tar and agricultural chemicals. The face of the octagon opposite the exhibit has no corresponding bay and is devoted to a display of plastics. The total amount of exhibiting area is approximately 600 sq. feet and the arrangement adopted has enabled this to be used to excellent advantage, in addition to possessing other useful features from the exhibition point of view. The colours of the rubber flooring in each section, starting with the section facing the office entrance, are violet, indigo, blue, dark green, light green, yellow, orange and red; in other words, the colours of the spectrum. The titles of the sections and sub-sections are sign-written both in French and in Flemish throughout. The labels are in French, with Flemish in addition where the descriptions are not too technical but are semi-popular. Except where there are models, the inside of the cases is covered with black velvet, but for the barium exhibit it is light blue.

The heavy chemicals exhibit consists of a model with a moving display, and indicates a few of the many products of the British heavy chemical industry. The individual products shown include acids, alkalies, general chemicals, bleaching agents, chlorine and chlorine products, nitrogen products, refrigeration chemicals and sundry chemical products.



At the Brussels International Exhibition. On the left is a general view of the British chemical exhibit from the fine chemicals bay, and on the right is a striking feature in the form of a model of an azo dyestuffs plant shown in the dyestuffs and allied products section.

In the plastics section there are bituminous plastics, showing raw materials and specimen articles, mainly for the electrical industry; together with cellulose type plastics, showing raw material and samples of finished products, such as a clock, hair brush, ping pong balls, fountain pens and golf tees. The raw materials shown for bituminous plastics are pitch, gum congo, asbestos (long, short and blue), gum copal, asphaltite, shellac and slate dust. The only raw material shown for cellulose type plastics is cellulose acetate moulding powder.

There are phenolic type plastics, showing raw materials, intermediate products and finished articles such as ash trays, jugs, cigarette boxes, table decorations, telephone, calendar, door handle, holder for dentist's drills, and cups. The raw materials shown are formaldehyde, phenol, phenolic type moulding powder wood flour filled, phenolic resinoid and wood flour. In the lower portion of the exhibit there are urea type plastics, showing raw materials, intermediates and

specimens of finished articles, such as a cocktail shaker, tray with glasses, tray, bowls, cruet, cigarette cases and manicure set. The raw materials and intermediates are urea, formaldehyde, urea/thiourea resin syrup, urea type moulding powder wood flour filled (three differently coloured samples), wood flour, disintegrated paper pulp and industrial moulding powder paper filled (two differently coloured samples).

The dyestuffs and allied products exhibit shows the main products derived from barytes and ilmenite, and features hydrogen peroxide. The sequence of production is shown by coloured ribbons. The exhibits consist of barytes, barium sulphide, barium carbonate, barium monoxide, barium hydrate, fine ground barytes, sodium sulphide (crystals), sodium sulphide, barium peroxide, ilmenite, persulphates, hydrogen peroxide, blanc fixe, titanium oxide pigment, titanium and ferrous sulphate, electrolytic cell, bisulphates, sodium perborate, titanium dioxide and copperas. Underneath the display is the main caption : " Chemistry produces Whiteness," and examples of bleaching with hydrogen peroxide.

The following products for the textile industry are shown : Sodium hydrosulphite, sodium formaldehyde sulphoxylate, mono-zinc formaldehyde sulphoxylate, di-zinc formaldehyde sulphoxylate, dimethylphenylbenzylammonium chloride, dimethylphenylbenzylammonium disulphonic acid, detergents, wetting agents, anti-felting agents, stripping assistants, mercerising agents, anti-foaming agents, emulsifying agents, scouring and desizing agents, waterproofing agents, finishing agents, solution salts, fat liquors for leather, chrome tanning products for leather, leather finishes and antiseptics.

The low-temperature tar (research) exhibit consists of a board which displays a schematic diagram showing the various products obtained from low-temperature tar, together with samples of each, arranged in a manner similar to that of the usual coal tar tree, except that it is done horizontally instead of vertically.

The Association of British Chemical Manufacturers has received a large number of awards for this exhibit at the Brussels International Exhibition, 1935. Out of the nine classes for which the exhibit was eligible it has been awarded seven Grand Prix (the highest award), one Diplome d'Honneur (the next highest award) and one Gold Medal. The awards are as follows :—

Diplome de Grand Prix : Photographic chemicals; Fertilisers and veterinary medicines; Finishing, bleaching, sizeing and printing (barium, titanium and oxygen compounds, dyestuffs for acetate rayon, products for the textile industry, fast colours on fabrics and cotton yarn, rubber chemicals, and dyestuffs for all industries); Products of mineral origin (phosphorus and its derivatives, borax and boric acid, barium, titanium and oxygen compounds, rare earths, aluminium derivatives); Products of vegetable and animal origin (essential, terpeneless and expressed oils, alkaloids, vitamins, hormones and sera, gelatin and glue); Hygiene (stains and indicators, analytical and research chemicals, water sterilisation).

Diplome d'Honneur : Apparatus and Process (cyanide bath case-hardening, water sterilisation, water softening and conditioning, road tar, ozo-dyestuffs plant).

Diplome Medaille d'Or : Chemicals for pest control.

New Technical Books

PHYSICAL PRINCIPLES AND APPLICATIONS OF MAGNETOCHEMISTRY. By S. S. Bhatnagar and K. N. Mathur. Pp. 375. Macmillan. 21s. net.

This book provides a readable and easily comprehensible account of the fascinating subject of magnetism and molecular structure, and furnishes investigators in physical chemistry and physics with a more or less complete and up-to-date account of theoretical and experimental researches in this field. The authors have attempted to make use of the pictorial representation of the atoms side by side with the newer treatment provided by the quantum theory, particularly with a view to presenting the semi-historical background of the whole subect. A knowledge of the barest outlines of wave-mechanics and spectroscopy is assumed, but in order to make the book complete within the range to which it is restricted an introduction to spectroscopy and atomic structure has been provided in Chapter V. The book is intended primarily for the chemist and the physicist, but it should also prove of interest to workers in the allied branches of metallurgy and engineering.

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THE CHEMISTRY OF CEMENT AND CONCRETE. By F. M. Lea and C. H. Desch. Pp. 429. Edward Arnold and Co 25s. net.

The literature relating to cement and concrete is now so extensive that even the specialist finds difficulty in keeping in touch with its many branches. This book gives a general survey of the chemistry of cement and concrete; it is intended for the chemist and also for the engineer or architect who has to deal with cement and concrete. Many of the earlier chapters are pure chemistry, but the later ones should provide for the engineer and architect information, which is otherwise difficult of access, on many problems of importance to them. The constitution of cements, the nature and properties of the compounds they contain, the properties of set cements and of the hydrated compounds present in them, all come under consideration. The testing of cement is discussed only in general outline, attention being directed primarily to an examination of the value and significance of the various tests. In the case of certain special properties of cements the technique of testing is described rather more fully. Methods for the determination of Lee lime in cement and of the heat evolution during hardening, and the more refined methods for determination of the fineness of cement fall into this category. Cementing materials other than Portland cement, have had considerable space devoted to them and a fairly full account is given of Portland blast-furnace and other slag cements, aluminous cement and, lastly, pozzolanas. The behaviour of concrete in use is discussed at some length in the last three chapters. Here such topics as the resistance of concrete to fire and frost are dealt with and are followed by a subject of much importance, the chemical resistance of concrete. An attempt has been made in this section to outline the conditions which may be expected to effect concrete deleteriously. The survey is based both on practical experience and on the results of the many large-scale trials and exposure tests which have been published. It represents the most ambitious survey of this type which has been attempted.

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STANDARD METHODS FOR TESTING PETROLEUM AND ITS PRODUCTS. 3rd Ed. Pp. 228. Institution of Petroleum Technologists, London. 7s. 6d. net.

Since the publication of the second edition of " Standard Methods for Testing Petroleum and its Products " in 1929, the Committees responsible for the work of investigating the methods have been actively engaged in the consideration of new methods and in the revision of the methods previously standardised. The considerable progress which has been made in the formulation of standard methods is clearly indicated by the size of the new book, which contains nearly 100 more pages than the second edition. In the first and second editions of the book the tests were arranged in classifications according to the particular product to which they applied. In the present edition the more logical method of arranging the tests in alphabetical order has been adopted. A special section to include such tests as "tentative" methods has been added. Included in this section are the methods for gum in motor fuels, knock-rating of motor and aviation fuels, and a multiple cup bath for the Redwood viscometer. The list of "standard" methods has also been increased considerably. Notable additions are the tests for greases (ash, consistency, drop point, free alkali and free acid), an aniline point test for kerosine, gas oil and fuel oil, the re-introduction of the pour point test in addition to seeting point, dilution of crankcase oil, a distillation test for cut-back bitumen and road oils, tetraethyl lead in gasoline, vapour pressure by the Reid method, and viscosity in kinematic units. Where possible, the tests have been kept in accord with those standardised by the American Society for testing materials, and thus some measure of international agreement has been attained. In those cases where complete agreement has not been possible on account of modification being necessary to meet British practice, this has been indicated by the addition of the word "modified" to the A.S.T.M. Serial Designation

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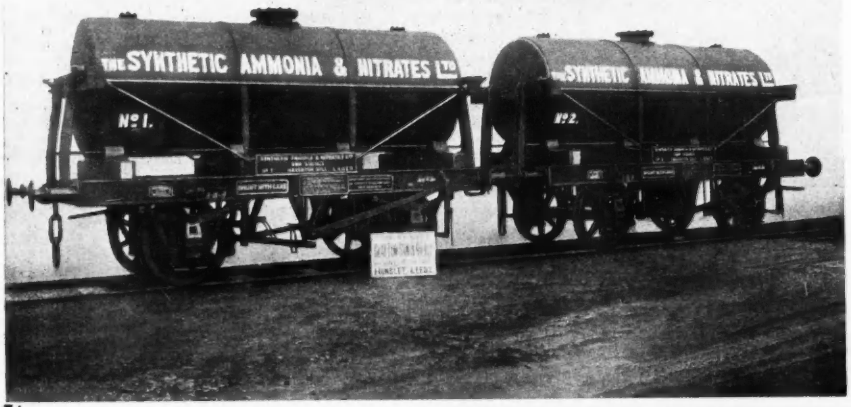

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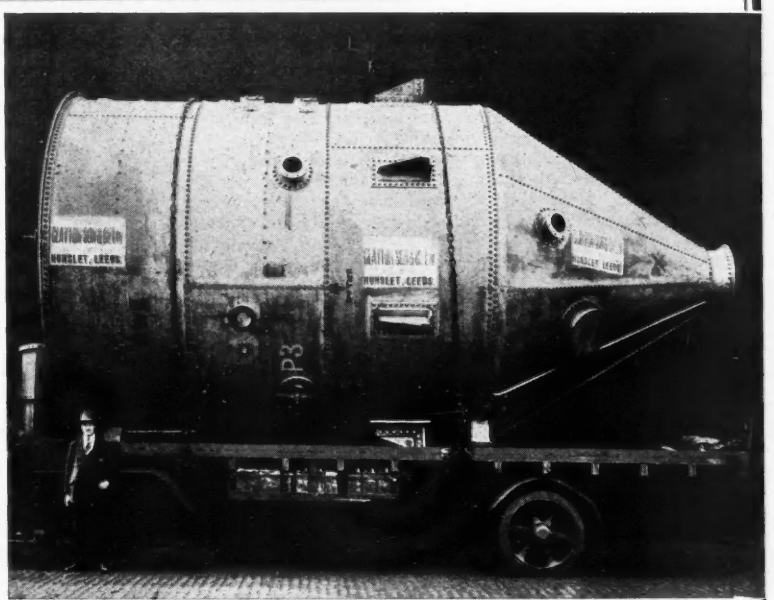

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Leather Trades Chemists' Problems

Points from Papers Read at the Brussels Meeting

SPEAKING on "The Microscope as an Aid to Tannery Practice," at the bi-annual conference of the International Society of Leather Trades' Chemists, held jointly with that of the Internationalen Vereins der Leder Industrie Chemiker, at Brussels, from September 1 to 6, Dr. R. H. Marriott said the microscope offered a ready means of examining the fundamental nature of hides, skins and leather. Its importance is obvious when it is realised that the main economic value of leather lies in its fibre structure and no method of ordinary physical testing or chemical analysis can give a complete valuation of the properties of leather. Different sorts of leather require certain types of fibre structure and a large number of photomicrographs indicate the permissible and desirable variations in structure.

Further, microscopical examination can indicate the parts of the tanning processes which have caused faults in the finished leather. Thus the microscope can readily detect which part of the process is in error and it can indeed be used as a quick method of control. It is possible to make a series of photomicrographs of hides and skins as they pass through the tannery and a survey of such a set of pictures enables the tanner to tell whether all the liquors are in true balance with each other.

Theory of Leather Dyeing

In a paper on "The Theory of Leather Dyeing," G. Otto said it had been shown that the chemical processes in the dyeing of leather with acid or direct dyestuffs must be considered to be in the first place reactions of the principal valencies. This, however, did not explain the considerable technical differences in the dyeing properties of the dyestuffs. The lecturer measured the affinity of a variety of acid and direct dyestuffs for untanned, and also for vegetable tanned hide substance by determining those *p*H value limits which were sufficient in a solution of the free colour acids to give the maximum saturation of the leather. The *p*H value limits, in the case of vegetable tanned hide substances, are more or less placed to the acid side, according to the kind of the vegetable tannin and the dyestuff applied. The results obtained are in accordance with the observations in practical leather dyeing. The lecturer drew the conclusion that in dyeing leather with anionic acting dyestuffs the reaction of the principal valencies is more or less influenced by auxiliary valencies.

Dr. F. Stather presented a paper on "The Amount, Rate and Stability of the Combination of Vegetable Tannins with Hide Substance." Tanning experiments were carried out with ten commercial vegetable tanning extracts under exactly controlled conditions using a uniform unground sample of collagen. After various tanning periods, determinations were made of the quantity of tanning material fixed, the comparatives rates of fixation and the stability of the hide substance-tannin combination for each of the materials.

As soon as the stronger influence of the different diffusion velocities of the individual tans into the hide was overcome, and so long as the fixation of tan had not approached too near the point of maximum fixation, the amount of tan firmly fixed at the end of a definite period for each single tanning material was approximately proportional to the square root of the time of tannage. That is, the velocity of fixation equals the square root of the time of tanning multiplied by a constant which is characteristic for each tanning material. From the calculated values for the fixation velocity constants, the various tans could be arranged in the following order of decreasing values of fixation velocities:—Chestnut, 15.2; natural quebracho, 13.7; sulphited quebracho, 13.4; myrabolams, 13.3; mimosa bark, 12.7; sumach, 11.3; valonia, 10.3; oak bark, 9.5; gambier, 9.4; pine bark, 7.1.

Stability of Fixation

With reference to the amount of fixation, *i.e.*, the percentage amounts of tan firmly combined with the hide at the maximum time of tanning, the materials could be arranged in the following order of decreasing amounts of tan fixed:—Natural quebracho, 53.3; sulphited quebracho, 52.2; mimosa bark, 51.9; myrabolams, 51.3; chestnut wood, 46.2; valonia, 45.6; gambier, 42.1; oak bark, 41.1; sumach, 40.9; pipne bark, 30 5 The stability of the fixation of the various tans by the hide powder was tested as follows using the same ten materials under controlled conditions. They were subjected to a continuous extraction with water for 28 days and the content of the leathers determined with respect to "free water solubles" and "fixed water solubles." The results showed that the content of "free water solubles" and also "fixed water solubles" were both influenced by the kind of tanning material used.

The following decreasing fixation values were obtained by taking as a measure of the fixation stability between tanning material and hide substance, the reduction of the tanning figure (Durchgerbüngszahl) of the leather substance brought about by a further 15 days washing with water, the leather substance having been previously freed from "free and fixed water solubles." Oak bark, 19.0; sumach, 19.1; sulphited quebracho, 20.9; mimosa bark, 21.4; natural quebracho, 21.6; chestnut wood, 22.1; myrabolams, 22.2; valonia, 23.4; pine bark, 25.2; gambier, 25.2.

Lignin Sulphonic Acid

The chemistry of lignin sulphonic acid and its behaviour as a tanning material was dealt with by A. Kuntzel, C. Riess and G. Konigfeld. The lignin sulphonic acid in sulphite cellulose extract is taken up by the basic groups of the hide. The combination is stable to washing by water and leads to a pronounced tanning of the hide fibre. The lignin sulphonic acid behaves similarly to synthetic tannins of the Neradol type, and like the latter is precipitated by anilinehydrochloric acid and by cinchonine. Both types of tanning bring about a blocking of basic groups in the hide. Thus the advantage which the so-called synthetic tannins exercise with reference to the protection of vegetable tanned leather against acid damage can also be claimed for lignin sulphonic acid. The acid has a fairly high average molecular weight. The degree of tannage obtained by the use of sulphite cellulose extract depends upon, in the first instance, the equivalent combining weight of the lignin sulphuric acid. The stochimetric relationship between lignin sulphonic acid and hide substance is, however, interfered with in the tanning process since reductions in the rate of diffusion can arise due to the large particle size of this tanning material. On the other hand, lignin sulphonic acid contains more than one SO_3H group, and it is not necessary for all groups to react with the hide. A further consideration is the increase in the combination of the tan which takes place in the leather on storage. The "tannin" content of a sulphite cellulose extract can be done quantitatively by precipitation with cinchonine. The author also deals with the composition of various sulphite cellulose extracts obtained from different liquors.

Mordanting and Dyeing Processes

A communication on the mordanting and dyeing processes was presented by E. Elod, who had conducted investigations in conjunction with S. Eislitzer. To understand the specific characteristics of the direct dyeing of chrome leather, he said, it must be realised that the dyeing process involves several different processes. If all the heterogeneous reactions peculiar to adsorption are left out of consideration as being the preliminary part of the process, then there remains to be discussed the influence of the rate of diffusion and the rate of chemical reaction. Owing to their greater particle size the rate of diffusion of the direct dyestuffs is generally considerably slower than that of the acid dyestuffs. The direct dyestuffs which only slowly diffuse into the interior of the chrome leather becomes chemically combined at the outer layers of the leather and thus hinder further diffusion and prevent "dyeing through." The question of whether the direct dyestuff and the free acid of the direct dyestuff entered into combination with the protein forming protein salts has

already been answered in the affirmative. The following experiment, however, serves to strengthen the evidence. The investigators have exhaustively dyed chrome leather with a direct dyestuff, under the conditions described by Elod and Hansel, until the maximum uptake of dyestuff was obtained (approximately 42 per cent.) and have investigated whether the dyed leather in this condition would take up acid dyestuffs. On the other hand, they have investigated whether such leather would take up direct dyestuffs. Both types of experiment gave negative results, and in addition they were able to show, with chrome leather, when only partially dyed with either acid or direct dyestuff until about half the maximum uptake is attained, that the further dyeing of such a leather with either direct or acid dyestuffs, respectively, is possible, and that the total quantity of dyesuff then taken up is again about 42 per cent. of the weight of the leather. These experiments show that in protein salt formation the direct dyestuffs combine at the same valencies of the protein as the acid dyestuffs.

"Dyeing Through" of Chrome Leather

In acid conditions the "dyeing through" of chrome leather with direct dyestuffs can only be accomplished with highly dispersed dyestuffs. With certain direct dyestuffs whose heterogeneity of particle size is particularly pronounced, the highly dispersed fraction may be brought successfully into the inner layers of the leather in the acid condition. Otherwise "dyeing through" can only be attained by working in alkaline conditions (about pH = 9) (where the basic groups of the protein are not reactive). The dyestuff is allowed to diffuse into the leather and after the inner layers have been reached the leather is brought into an acid bath (pH about 2.5). The acidification causes the basic groups to become reactive and combine with the direct dyestuffs in the proximity, with the formation of protein salts.

A further demonstration of the formation of protein salts in these dyeing processes may be furnished from a study of the cause of the so-called "Fastness to washing." If the postulation of the formation of protein salts by the acid or direct dyestuff is correct, it should be possible to demonstrate that with dyes of good fastness to washing their protein salts exist and are only slightly dissociated, whilst the protein dye salt of those which show poor fastness to washing must be appreciably dissociated in the presence of water, and so with the establishment of a dissociation equilibrium the dye acid anion is given up to the water. In order to be able to establish this argument it is necessary to ascertain the dissociation constant of the free dye acid of acid and direct dyestuffs. (This is so because the protein dye salt is always composed of the same base, *i.e.*, the protein substance and therefore the dissociation constant of the base has no bearing on this problem). The authors showed with the help of the method previously worked out for the determination of the dissociation constants of the free dye acids, that, in the case of these dyestuffs, those of which the free dye acid gave a low dissociation constant also showed good fastness to washing, whilst the most acid dyestuffs, having high dissociation constants, are not fast to washing. If a series of acid or direct dyes be arranged in order of dissociation constant, it has been found that the fastness to washing is a parallel function. The fact that the direct dyes have dissociation constants of low values shows why such difficulty is experienced in "dyeing through" in acid conditions with these dyes, as they form no, or very little, dissociated protein dye salt, but become fixed in large quantities in the outer layers and are not able to diffuse into the more deeply situated parts.

Analysis of Tanning Materials

In a paper on "The Chromatographic Adsorption Analysis of Tanning Materials," W. Grassman said the fluorescence analysis of tanning materials was found to be more refined and considerably more serviceable when used in conjunction with the "Chromatographic Adsorption Analysis" method. The chromatographic adsorption analysis makes use of the fact that by percolation of a mixture of substances in a tube filled with an adsorbent powder (*e.g.*, alumina, kaolin, silica gel, etc.), a characteristic separation of the mixture into layers occurs, in which the strongly adsorbed constituents of the mixture become retained in the first layer whilst, according to their adsorption affinities, the remainder infiltrate to different depths in the adsorbent. Vegetable tanning extracts have been investigated and it has been observed that under ultra-violet light there is not a uniform colour of fluorescence, but owing to the separation of the individual fluorescing components the characteristic series of several fluorescing bands between the darker layers may be seen. ("Fluorescence-Chromatograph").

The lecturer demonstrated the experimental method and showed a number of chromatographs, including chromatographs of the complete examination of quebracho, mimosa, oak, chestnut and pine extracts. A number of samples of these tanning materials from various sources and prepared by different methods were examined, and it was found that when using the same absorbent a characteristic indication of certain tanning materials was always obtained on the chromatograph, but occassionally certain variations were observed with particular brands which appeared to be characteristic. Generally the pH value of the solution has little influence on the chromatograph only that of quebracho is altered in a characteristic way in strongly acid conditions. Sulphiting, however, has a definite if not very pronounced effect.

Isolation of Individual Constituents

The isolation of individual constituents detectable by the chromatograph is being undertaken. From pine bark a luminous yellow fluorescent body, which is poly-phenolic in character, has been successfully prepared and crystallised. The acetyl and methyl derivatives have also been isolated and crystallised. This substance exists in the extract in the form of a glucoside and does not appear to be identical with any of the components of tanning materials known at present.

The importance of alkalinity in the preparation of tanning extracts from spent sulphited cellulose liquors was stressed by L. Masner and V. Samec. The purification of spent sulphited cellulose liquors for tannery purposes may be carried out chiefly in either acid or alkaline conditions. This purification involves the removal of calcium and iron salts and eventually the removal of free sulphurous acid. Only purification in alkaline condtions is practicable and it is interesting therefore to investigate the influence of the alkalinity on the quality of the sulphited cellulose liquor. The neutralisation of the liquor with alkali can be carried out either cold or hot. At pH values above 7 there is a very marked darkening if the liquors are hot when purified. Heating the alkaline liquors is not accompanied by any improvement in the tanning properties and this procedure should be avoided as far as possible in this process.

Influence of Alkalinity

Except at high concentrations of alkali, the influence of the degree of alkalinity on the tan content is not very great. It has been shown from titration curves that acid groups have been set free during the neutralisation, probably accompanied by a decrease in the molecular size and a greater solubility in water. From general theoretical conceptions, it would be expected that this change would be associated with poorer tanning properties, but practical tanning experiments using various strongly alkaline sulphited cellulose extracts have shown no difference. The sugar content of the alkaline liquors decreases on account of hydrolysis in alkaline solutions. As a result unfermentable non-tans are formed from the fermentable sugars, thus reducing the production of acids in the tan liquors.

The concentration of mineral constituents in the crude liquor may be satisfactorily reduced by alkaline purification. It is recommended that the free sulphurous acid should largely be removed from the solution in the gaseous state before neutralisation, since neutralisation of the dissolved sulphurous acid causes the neutral salt content of the final liquor to be unnecessarily high. The alkalinity of the liquor naturally affects the material of which the apparatus is made. Stainless steel has been found to be the most suitable material for this purpose.

Lactic Acid to be Produced in Hungary

A NEW corporation has been founded under the name of "Potato Crushing and Chemical Industry Co., Ltd.," in Budafok, Hungary. The chief product will be lactic acid for use in the leather and textile industries. The daily producton is expected to be 1,200 to 1,300 kg. This will remove the necessity of importing lactic acid from abroad.

The British Association Meeting, 1935

Final Reflections by Professor H. E. Armstrong

TO continue the indictment against saccharose—not sucrose, please. Even the eternal verities underlying chemistry are up in arms in protest against our growing sugar-beet. The tops are good food for cattle but the Association was told that, when these are fed to cows, their milk is tainted with trimethylamine, derived from betaine, of which the leaves contain several per cent. Formerly, beet sugar was tainted by betaine and it is said that the bees still detect it, even in the modern highly refined commercial product—one of the most marvellous that is made, in the nearness of its approach to purity.

The last straw is the way in which we are being assiduously persuaded into the American ice-cream habit—which is sure bad for our tummies. Science is now misapplied, running about on wheels to this end, in the form of carbon dioxide bricks. We seem ever to misuse our knowledge—rarely to use it to mental and moral ends. Sir Leonard Hill, in open conference at Margate last week, referring to the modern craze for exposing the skin, opportunely drew attention to the fact, that children lose heat far more easily than adults and to the unwisdom of over-exposing their skins to cold. To chill both their insides and their outs cannot be good for them, apart from the harm done by sugar: no wonder the poor little dears crave it.

King Coal

Extremes meet. From chilling by sugar, we pass to heating by coal. The address in Section C was an essay on our ignorance of Coal, with suggestions for improvement by an expansion of Stopesian nomenclature. Pity 'tis that, having done so much work in favour of birth control, the good lady cannot see that charity begins as home and add to our obligations to her by advocating control of words. This is far more necessary, in scientific circles, in which there is no overplus of families but an insensate tendency to mime with a mint of fatuous phrases. If a new Mark Twain could tramp abroad among them, he would certainly make us laugh consumedly; a modern Sydney Smith, lecturing at the Royal Institution on the subject, would convulse the building to its foundations: Albemarle Street would be made impassable by parking cars as it once was by broughams.

"Give a dog a bad name and hang him" is a motto to be held up even to B.A. essayists. Resort to names is always an indication of inability to face real issues. Call a thing a catalyst—not knowing the least what a catalyst is or does—nothing more need be said: you have named it—for what more can you be asked?

The address is mainly a tasty hash of modern microscopical study of the coal surface. The President,

> . . . a most illustrious wight,
> A man of fine new words, fashion's own knight,

comforts us with the assurance that, to the extent of at least seventy-five per cent., bright coal consists of *an uniform brown substance* representing, for the most part, portions of plant tissues with their organised structures exquisitely preserved. Although it has been impossible to demonstrate that all this material possesses structure, he ends the story by calling it *Vitrinite*, as suggested by Dr. Marie Stopes. What's in a name? Nothing! Brown substance everyone can understand, *Vitrinite* no one. To use it is to forget coal, just as iron is put out of sight by the modern metallurgist in calling it ferrite.

A Mere Inorganic Residue

The problem remains: "Is Coal a mere inorganic residue or primarily a synthesised material, formed by organic decay, through the agency of anaerobic bacteria?" Have the organisms merely bitten off bits from plant remains or have they passed these through their bodies? Farmyard manure seems to be of this latter order. Results of recent work in Professor Bone's laboratory are an indication that woody tissues may be a closer approach to coal in composition than has been supposed. One thing only is certain. It will be long ere the geologist as such can handle the problem; this is primarily a subject for chemist and botanist. We must first study vegetable materials and their decay away from air, if we are to understand coal.

A full discussion of the problems of the use and abuse of coal would have been of the greatest possible value at the moment. At least, the poor miners who are now in open revolt might have been helped to understand their position—to see that, for the present, the amount of coal used is likely to diminish. Coal is the ugly duckling of industry. Essentially, excepting agriculture, it is our one source of national income. No industry, in the main, has been less intelligently conducted; no industry has been less subject to scientific study and control or more open to commercial greed. Our state aided fuel research has been simply an expensive farce. Although coal is our industrial life blood, we have no care for its circulation. Every section of the Association might and should have been called in to discuss its problems, from A to Z.

What is even less excusable is the failure to impress upon the schools the need of making common sense geology—not the professional brand—the foundation of geographical teaching. At least, attention might have been called to the encouraging growth of public interest in the subject, shown by the success that has attended the opening of the new Geological Museum at South Kensington. To have secured a steady attendance of 1,000 or more a day must be a real reward to those who have had the interests of the subject at heart.

Joy Riding at the Poles

While Section D listened to an advocate of joy riding at the poles, Section E was asked to consider Economic Nationalisation and International Trade, Section F the Stability—it should have been Instability—of Structures, all related topics. To reduce Geography to so small an issue was a sin of the first order. The Association, in future, must be a Geographical Association, if it have any public value: Geography being the study of the Earth and all its ways, including us weary beings upon it.

Section F is labelled a Section of Economic Science and Statistics. Can Economics be a *Science* when it only takes count of final balance sheets and its advocates know nothing of the sciences at the root of production and manufacture? What are statistics worth collected in such ignorance, without any consideration of the psychology behind man's interactions—especially the psychology of commercial greed.

Is it not a fact that what we most need is, as of old, to turn the money changers out of the temple and introduce some equitable methods of accounting transactions. At least we have to give money a value. At present it has none, because the world has no standards of value, only linear standards and derivative standards of area, volume, mass and time. The standard of value we defined years ago has never been enacted, because we have allowed ordinary, commercial trading in gold. The metal must be put out of commercial bounds and an unalterable value assigned to it, if money is to have a real value as a measure corresponding to that of ordinary metrical units. Unfortunately, economists have yet to learn the meaning of the term Standard: it is misused daily.

Society to-day is hopelessly misled by specious food advertisement, by uninformed articles in the Press, by widely spread wireless talk; we are everywhere carried into temptation; even professors advise us to pig it rather than concern ourselves with cookery; soon we shall know not how or when to eat: those who do know, cannot get the right foods. The bread we are billed to eat more of is not worthy of the name; the beer is beer no longer; the butter is too often synthetic. We have lost the arts of milling and baking. The *dieucephalon* be damned, say many of us, if it cannot be induced to bring on such holy rage in chemists and physiologists, such desire to save us from the destruction that must surely come upon society if we suffer so much ignorance to prevail, that they will renounce all academic research in favour of public service.

After Section I in the Association alphabet comes J—a letter which never would be missed: why it was ever inserted

is difficult to say. Sydney Smith has well remarked: "God has made nothing so curious as human creatures"—which is very true and perhaps the most curious of them all is the psychologist. He assumes that he can deal with the human *psyche,* knowing nothing of his own *corpus.* All the B.A. sciences put together do not suffice us, as yet, to understand ourselves the least little bit—except that we are the creatures of our excretions and our foods, the bornest of fools, neglecting every opportunity to improve ourselves that our superabundance of knowledge should surely give. The attempt at Norwich to discuss *Personality and Age* obviously could come to nothing and it did.

Hugging the Laboratory Stool

Section K may be ranked with Section I. The chief value of the address on *Some aspects of Plant Pathology* is that it shows how not to be a botanist. Botany has long ceased to be a study of the living plant and its growth; it is now concerned with the care of the pests which infest it under the unnatural conditions of modern agriculture, pests which probably would have no hold if the plant were properly grown. Botany to-day is the art of looking down microscope tubes, making cultures of fungi and subdividing them by as many new names as possible. The modern researcher hugs the laboratory stool and hates to go out into the open—so the poor plant is left to its fate in the field and "Fisherised" to the exclusion of every vital interest. We need a Botany to-day that will concern itself with Bread that can be eaten with advantage; with Grass from which real milk may be made; with Manures rather than with Mycology.

The value of the address in Section L, as an outburst against present-day criminal abuse of examinations, by University authorities, has already been discussed. Unfortunately, the section itself contributed nothing to the advance of knowledge in education—as usual, it gave itself over to the tender mercies of freaks and might just as well have met under the futile banner of Section J. The Section goes steadily from bad to worse. The main author of its being, thirty-three years ago, I feel that it has achieved no one of the things those few of us who were concerned in establishing it had hoped it might: it has in no way helped on education—simply because teachers have taken no part and no interest in its doings. It has been one of the most bitter disappointments of my life. We need to begin the struggle afresh; go back to Newcastle; again carry coals there, however slight may be the demand.

Last of the Mohicans comes Agriculture, fitly labelled as Section M, the initial letter in Manure. Yet nothing is said of Manure, the vital factor of the industry: instead, the section is asked to consider the financial and economic results of State control in Agriculture. Very interesting, of course—but to what end is State control to be exercised? This is the crux, the more than difficult problem before us, simply because we are so ignorant of all that pertains to agriculture, Rothanstead notwithstanding. That State control will be exercised, in the near future, is more than likely—it will be the only way of applying knowledge, when we have it of the right sort. Whether or no the industry will resume its prosperity is beside the point. It is our root industry, the industry of our being, as we are of the earth earthy and are made from the soil. The prime criterion, therefore, cannot be mere commercial advantage but quality—an attribute scarce taken into account as yet in farming. Agriculture in the future must include and dominate all other sciences.

Extinction or Drastic Reconstruction ?

The reform of the Association means a general reform. A beginning must be made with the schools—a few schoolmasters hung—even martyrs made among those few who would make us better. If I had been shot years ago, as I deserved to be, some public notice might have been taken of my counsels. As it is, they are set aside as "Fanny's little way." Still, I have the satisfaction of having made an experiment, lasting at least sixty years, from which I have learnt how little can be done—yet how much that little may be made to count on power of doing. The future is in the lap of no Gods but of the Universities. They need to be reformed, root and branch, so that they once more become centres of information and inspiration: centres of a true education for life. Professors must learn to teach and be teachers—leaving research for the vacations, with a few chosen helpers.

It will be remembered that in Hunting the Snark,

"They threatened its life with a railway share,
They charmed it with smiles and soap."

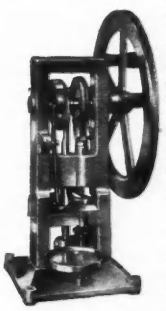
The life of the Association is threatened with something much more terrible and omnipotent—a Railway Director, who may charm it with smiles and softened water, if not posters galore. As an economist, too, he may seek to encase it in a streamline garment, cut for the occasion, of some public utility and moving power. The King that now has but fancied clothes needs courtiers who will give him real wearable ones. Will the new President be able to provide them? If he speak as economist, let us hope it will be in the sense defined in Ruskin's *A Joy for Ever*: that he will lead his team to apply their labour rationally and distribute their produce seasonably. Ruskin, in 1857, speaking as economist, asked his hearers "To consider with him the kind of laws by which we shall but distribute the beds of our national garden and raise in it the sweetest succession of trees pleasant to the sight and to be devised to make us wise." This is still the task before the economist—may he compass it.

The Chemists' Exhibition

New Developments in Bottles

THE 44th Chemists' Exhibition, organised by the "British and Colonial Druggist," was held last week at the New Hall of the Royal Horticultural Society, Westminster, where 85 firms engaged in the manufacture or packing of pharmaceutical preparations and sundries were exhibiting.

William Gardner and Sons (Gloucester), Ltd., were showing a number of machines of special interest to manufacturing chemists, including their patent "Rapid" sifters and mixers, patent spraying plant, and drying and grinding machinery.



The Manesty Hand Tablet Machine.

Manesty Machines, Ltd., were demonstrating the latest addition to their range of tablet-making machinery—the Manesty hand tablet machine. This machine is designed primarily for making small batches of tablets or fo rexperimental purposes. It will produce 100 tablets per minute and of any size up to half an inch in diameter.

A large variety of high quality bottles, many of new design, and of great interest to chemists, druggists and dispensers were exhibited by the United Glass Bottle Manufacturers, Ltd. The well-known "washed sterilised ready for use medicinal bottle service"—the standard bottle for dispensing—has been improved without extra cost to the user. The white aluminium and moulded blacked Korkalite screw caps now have the composition cork wads faced with Resistol paper, which prevents the majority of liquids attacking the cork liner. The screw-cap now seems to have practically ousted the old-fashioned cork.

Viscose Development Co., Ltd., were showing a large range of bakelite cups and containers moulded from phenol and urea resins.

Prominent among the exhibits of Howards and Sons, Ltd., was their standard ether for producing anæsthesia. It is very handily packed in amber glass bottles of a special shape which makes for ease and safety of handling. Their brand of iso propyl alcohol is a good substitute for S.V.R. in the manufacture of essences and perfumes and has the advantage of being very much cheaper.

The Middlesex Laboratory of Glandular Research had a very interesting display. A complete series of sex-hormones isolated, not only from animal sources but also from plants, were shown.

Tonility Laboratories, Ltd., were exhibiting their Halmogen tablets which constitute an entirely new therapeutic measure. Great things are claimed for Halmogen and the product is backed with a weight of clinical evidence. The main constituent of the tablets is magnesium chloride. Also present are minute traces of the iodide and fluoride, but their presence is entirely unnecessary and they exercise no effect at all. Their removal would mean bringing the magnesium chloride to such a high state of purity that the cost of the product would render it a commercial impossibility.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE London chemical market continues to receive a good steady general demand, with prices in practically all sections firm. All metallic salts are higher under the influence of higher prices for metals. The coal tar products market remains steady; white spirits are stiffening in price.

MANCHESTER. — The general political unsettlement seems to be having little or no actual influence upon the course of business on the Manchester chemical market, although there is a natural atmosphere of uncertainty in evidence. Steady deliveries of the leading heavy products continue to be taken up against contracts by users in and around Manchester, and textile chemicals are doing better. Except for a relatively few transactions not much interest is being shown at the moment in connection with contracts, but the next month or so should witness a marked speeding up in this connection. In the meantime, the market position generally is firm, and, with one or two exceptions, this also applies to the by-products. In the latter a strong demand is reported this week for carbolic acid creosote, and the light materials.

SCOTLAND.—There has been a steady day-to-day demand for chemicals for home trade during the week, but not much fresh inquiry for export. Prices generally remain firm at about previous figures, but red lead and litharge have advanced £1 per ton.

Price Changes

General Chemicals.—ACID, TARTARIC (Manchester), 1s. 0½d. per lb.; LEAD, RED (Scotland), £25 to £27 per ton.

Coal Tar Products.—NAPHTHALENE, purified crystals, £10 10s. per ton.; ACID, CARBOLIC, crystals (Manchester), 7d. to 7¼d. per lb.; PYRIDINE, 90/140%, 5s. 3d. to 8s. per gal.; TOLUOL, 90%, 1s. 11d. per gal.; pure, 2s. 3d. to 2s. 4d. per gal.

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals, £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. to 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. 0¼d. per lb.

ALUM.—SCOTLAND: Lump potash. £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K ports.

ANTIMONY SULPHIDE.—Golden, 6¼d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered. £23 ex wharf. MANCHESTER: White powdered Cornish, £22, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4⅞d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD, ACETATE.—LONDON: White, £35 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 10s.; brown, £32 10s.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—LONDON: 30%, £16 to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d. to 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb.

SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 10s. per ton. LONDON: £22. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3¾d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 2s. 6d. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7d. to 7¼d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9¾d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North; 5d. London. MANCHESTER: 5¼d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3¼d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 3d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 11d. per gal.; pure, 2s. 3d. to 2s. 4d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

PITCH.—Medium, soft, 32s. 6d. per ton, in bulk at makers' works.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £12.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

METHYL ACETONE.—46-50%, £43 to £47 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.

WOOD TAR.—£2 to £4 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price has been announced at £7 5s. per ton, less 7s. 6d. for October delivery, neutral quality basis 60.6% nitrogen in 6-ton lots delivered to farmer's nearest station.

CALCIUM CYANAMIDE.—The price for October delivery is £6 17s. 6d. per ton delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station, all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE AND NITROGEN PHOSPHATE FERTILISERS.—It has been announced that these products are at present obtainable at last season's prices so far as existing stocks permit, provided delivery is taken before November 30, 1935.

Latest Oil Prices

LONDON, Oct. 2.—LINSEED OIL was firm. Spot, £28 10s. per ton (small quantities); Oct., £26; Nov.-Dec., £26 5s.; Jan.-April, £26 15s.; May-Aug., £27 2s. 6d., naked. SOYA BEAN OIL was steady. Oriental (mulk), Oct.-Nos. shipment, £21 5s. per ton. RAPE OIL was firm. Crude, extracted, £35 per ton; technical refined, £36 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian, crude, £25 per ton; refined common edible, £28 15s.; and deodorised, £30 15s., naked, ex mill (small lots £1 10s. extra.) TURPENTINE was easy. American, spot, 43s 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £26 17s. 6d. per ton; Oct.-Dec., £26 5s.; Jan.-April, £26 10s.; May-Aug., £26 15s. COTTON OIL, Egyptian, crude, spot, £25 10s.;; edible, refined, spot, £27 10s.; technical, spot, £27 10s.; deodorised, £29 10s. naked. PALM KERNEL OIL, crude, f.m.q., spot, £21, naked. GROUNDNUT OIL, extracted, spot, £32 10s.; deodorised, £35 10s.; deodorised, £35 10s. RAPE OIL, extracted, spot, £34; refined, £35 10s. SOYA OIL, extracted, spot, £26 10s.; deodorised, £29 10s. per ton. COD OIL, f.o.r., or f.a.s., 25s. per cwt. in barrels. CASTOR OIL, pharmaceutical, 42s. 6d. per cwt.; firsts, 37s. 6d.; seconds, 34s. 6d. TURPENTINE, American, spot, 45s. 3d. per cwt.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	Oct. 1.	Sept. 24.
Anglo-Iranian Oil Co., Ltd. Ord.	60/-	60/-
,, 8% Cum. Pref.	33/6	33/-
,, 9% Cum. Pref.	35/-	33/9
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	4/0¾	4/0¾
Associated Portland Cement Manufacturers, Ltd. Ord.	57/-	56/6
,, 5½% Cum. Pref.	27/-	27/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	62/6	62/6
Bleachers' Association, Ltd. Ord.	5/6	5/6
,, 5½% Cum. Pref.	9/0¾	9/0¾
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	48/6	47/9
Borax Consolidated, Ltd. Pfd. Ord. (£)	97/6	97/6
,, Defd. Ord.	17/-	16/9
,, 5½% Cum. Pref. (£10)	£11/5/-	£11/5/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	8/1½	8/1½
,, 5% Cum. Pref.	10/7½	10/7½
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£88
British Celanese, Ltd. 7% 1st Cum. Pref.	24/7½	24/4½
,, 7½% Part. 2nd Cum. Pref.	21/-	20/6
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/-	5/3
,, 4% 1st Mort. Deb. Red. (£100)	£90	£90
British Cyanides Co., Ltd. Ord. (2/-)	3/-	3/-
British Drug Houses, Ltd. Ord.	20/-	20/-
,, 5% Cum. Pref.	21/3	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	5/9	5/9
,, 8% Pref. (Cum. and Part.)	27/6	27/6
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	46/3	46/10½
,, 5½% Cum. Pref.	26/3	26/3
,, 4¼% First. Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	105/-	106/3
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	96/3	93/9
,, 6% Cum. Pref.	29/-	29/-
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	18/1½	18/1½
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	7/6	8/1½
,, 5% Pref. (Cum.)	13/1½	13/9
Cellulose Acetate Silk Co., Ltd. Ord.	13/9	13/1½
,, Deferred (1/-)	2/4½	2/4½
Consett Iron Co., Ltd. Ord.	10/6	10/9
,, 8% Pref.	27/6	27/6
,, 6% First Deb. stock, Red. (£100)	£106	£106
Cooper, McDougal & Robertson, Ltd. Ord.	32/6	32/6
,, 7% Cum. Pref.	28/9	28/9
Courtaulds, Ltd. Ord.	53/1½	54/4½
,, 5% Cum.	25/7½	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	30/-	30/-
,, 7½% "A" Cum. Pref.	31/10½	31/10½
Distillers Co., Ltd. Ord.	91/6	90/6
,, 6% Pref. Stock Cum.	29/6	29/6
Dorman Long & Co., Ltd. Ord.	20/-	19/9
,, Prefd. Ord.	30/-	27/6
,, 6½% Non-Cum. 1st Pref.	22/3	22/3
,, 8% Non-Cum. 2nd Pref.	20/3	19/7½
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£103	£105

Name.	Oct. 1.	Sept. 24.
English Velvet & Cord Dyers' Association, Ltd. Ord.	4/4½	5/-
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/1½
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£107	£107
Gas Light & Coke Co. Ord.	26/6	26/9
,, 3½% Maximum Stock (£100)	£90/10/-	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£107/10/-	£107/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£89/10/-	£89/10/-
,, 5% Deb. Stock, Red. (£100)	£116/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114/10/-	£114/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	13/1½	13/1½
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	30/-
Imperial Chemical Industries, Ltd. Ord.	34/-	33/9
,, Deferred (10/-)	8/1½	8/1½
,, 7% Cum. Pref.	31/6	31/6
Imperial Smelting Corporation, Ltd. Ord.	14/-	14/-
,, 6½% Pref. (Cum.)	23/9	24/3
International Nickel Co. of Canada, Ltd. Cum.	$30⅝	$30⅝
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	107/6	107/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	6/3	6/10½
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	30/-	30/-
,, 8% Cum. "A" Pref.	31/-	32/-
,, 20% Cum. Prefd. Ord.	76/10½	76/10½
,, 5% Cons. Deb. (£100)	£107	£107
,, 4% Cons. Deb. (£100)	£104	£104
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£50	£50
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/3	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	39/6	39/-
,, 1st Pref. 6½% Cum.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£65/10/-	£64/10/-
Reckitt & Sons, Ltd. Ord.	111/3	111/3
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	43/9	43/9
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£125/10/-	£125/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£108/10/-	£108/10/-
,, Perpetual 3% Deb. (£100)	£90	£90
,, 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Staveley Coal & Iron Co., Ltd. Ord.	46/3	46/3
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	73/1½	73/9
Unilever, Ltd. Ord.	28/9	28/1½
,, 7% Cum. Pref.	28/3	28/3
United Glass Bottle Manufacturers, Ltd. Ord.	39/-	38/6
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd Ord. (6/8)	18/9	18/9
,, 6% Cum. Pref.	23/9	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	7/6	7/6
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£101	£101

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications open to Public Inspection

MAKING N-DICHLORO-AZO-DICARBONAMIDES.—Wallace and Tiernan Products, Inc. March 17, 1934. 10210/34.

AMINES, preparation.—H. T. Böhme A.-G. March 17, 1934. 1413/35.

ALKYLENES, preparation.—H. T. Böhme A.-G. March 17, 1934. 1414/35.

REMOVING TIN FROM NJOBIUM ALLOYS.—Electro Metallurgical Co. March 21, 1934. 2337/35.

CHROME-IRON ORES, manufacture.—M. J. Udy. March 19, 1934. 7060/35.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. March 17, 1934. 8406/35.

ELECTROLYTIC MANUFACTURE OF BORIDES.—Soc. D'Electro-Chimie, D'Electrometallurgie, et des Acieries Electriques D'Ugine. March 17, 1934. 8446/35.

VINYL-TYPE MONOHALIDES, treatment.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. March 19, 1934. 8603/35.

SULPHONATION PRODUCTS of aroylated amines, manufacture.—I. G. Farbenindustrie. March 22, 1934. 8878/35.

ANTHRAQUINONE DYESTUFFS and processes for their manufacture.—Chemical Works, formerly Sandoz. March 21, 1934. 8909/35.

SYNTHETIC RESINS.—British Thomson-Houston Co., Ltd. March 23, 1934. 9037/35.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. March 22, 1934. 9040/35.

Specifications Accepted with Date of Application

ORGANIC WASTE, treatment.—W. W. Triggs (G. H.Earp-Thomas). Dec. 15, 1933. 435,380.

POLYNUCLEAR ORGANIC COMPOUNDS, production or recovery.—J. Y. Johnson (I. G. Farbenindustrie). Fez. 8, 1934. 435,254.

ETHYLENE AZO DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Feb. 16, 1933. 435,449.

QUATERNARY AMMONIUM COMPOUNDS, manufacture and application.—A. Carpmael (I. G. Farbenindustrie). Feb. 20, 1934. 435388.

HYDROGENATION OF CRESOLS and other phenolic compounds.—Yorkshire Tar Distillers, Ltd., and E. B. Maxted. March 13, 1934. 435,192.

PROCESS FOR REFINING LIGHT OILS and distillates thereof obtained from the distillation or hydrogenation of coal or coal tars and products produced thereby.—W. A. Patrick, jun. March 29, 1933. 435,194.

HORMONES, manufacture of preparations.—I. G. Farbenindustrie. March 18, 1933. 435,195.

HYDROGEN PEROXIDE SOLUTIONS, stabilising.—B. Laporte, Ltd., I. E. Weber and W. S. Wood. March 17, 1934. 435,401.

COPPER-CONTAINING AZO DYE, manufacture and application.—Imperial Chemical Industries, Ltd., and M. Mendoza. March 19, 1934. 435,315.

TRIALKYLAMINES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 19, 1934. 435,404.

SELENIUM COMPOUNDS of the benzanthrone series, manufacture E. I. du Pont de Nemours and Co. March 18, 1933. 435,321.

HYDROGENATION OF CARBONACEOUS MATERIALS, process and apparatus.—F. Uhde. March 20, 1933. 435,457.

HYDROGENATED MONONUCLEAR HETEROCYCLIC CARBOXYLIC ACIDS and their salts.—E. I. du Pont de Nemours and Co. March 21, 1933. 435,461.

KETOLS, production.—I. A. Davies and Imperial Chemical Industries, Ltd. March 22, 1934. 435,466.

TRIMETHYLAMINE, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 23, 1934. 435,200.

DYESTUFFS of the azine series, manufacture.—I. G. Farbenindustrie. March 23, 1933. 435,479.

BARBITURIC ACID DERIVATIVES, manufacture.—I. G. Farbenindustrie. March 25, 1933. 435,480.

CONVERTING UNSATURATED PRIMARY OR SECONDARY ALCOHOLS into their corresponding unsaturated carbonyl compounds, process.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 8, 1933. 435,494.

PRODUCING OXYGEN of high purity, process and apparatus.—Linde Air Products Co. May 18, 1933. 435,281.

CYCLIC KETONES, process for the manufacture.—Schering-Kahlbaum A.-G. June 13, 1933. 435,336.

KETENE AND ITS DERIVATIVES, preparation.—Consortium für Elektrochemische Industrie Ges. Sept. 16, 1933. 435,219.

SULPHURISED DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Aug. 23, 1933. 435,342.

WATER-SOLUBLE MINERAL ACID DERIVATIVES of alkylamines of high molecular weight, manufacture.—Deutsche Hydrierwerke A.-G. Aug. 19, 1933. 435,290.

INDIGOID VAT DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Sept. 22, 1933. 435,349.

GASOLINE, fractionation.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 8, 1933. 435,230.

Applications for Patents

(September 19 to 25 inclusive.)

ORGANIC COMPOUNDS, manufacture.—Aceta Ges. (Germany, Nov. 1, '34.) 26550.

ALUMINIUM BASE ALLOYS.—Aluminium, Ltd. (United States, Oct. 25, '34.) 26458.

CATHODE-RAY TUBES.—W. E. Benham and Pye Radio, Ltd. 26445.

RECOVERY OF WASTE HEAT from furnace gases.—H. A. Brassert and Co., Ltd., H. C. Dawson and T. Thomson. 26493.

DERIVATIVES OF CELLULOSE, ETC., manufacture.—British Celanese, Ltd. 26340.

CELLULOSE ESTERS, production.—British Celanese, Ltd. (United States, Sept. 29, '34.) 26402, 26403, 26405, 26406.

DYEING MATERIALS CONTAINING CELLULOSE.—A. Carpmael (I. G. Farbenindustrie). 26334.

ADJUSTING AGENTS FOR DYESTUFFS.—Coutts and Co. (I. G. Farbenindustrie). 25996.

ACYLATED AMINES, manufacture.—Coutts and Co. (I. G .Farbenindustrie). (June 15.) 26567.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to October 11, 1935.

Rhodanize.. 561,208. Class 1. Salts of precious metals for use in manufactures; and electrolytes containing rhodium for use in electroplating. Baker Platinum, Ltd., 52 High Holborn, London, W.C.1.

Aquador. 561,376. Class 1. Water softening preparations. Drake & Gorham, Ltd., 36 Grosvenor Gardens, London, S.W.1.

Neustab. 561,986. Class 2. Chemical substances used for agricultural, horticultural, veterinary and sanitary purposes. Boots Pure Drug Co., Ltd., 37 Station Street, Nottingham.

Opposition to the registration of the following trade marks can be lodged up to October 18, 1935.

Bellcid. 561,079. Class 1. Dispersing agents, being chemical substances for use in the precipitation of colouring matters in the manufacture of pigments. The Geigy Colour Co., Ltd., National Buildings, Parsonage, Manchester, 3.

Kalampron. 562,090. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. Society of Chemical Industry in Basle (a Joint Stock Company organised under the laws of Switzerland), 141-227 Klybeckstrasse, Basle, Switzerland; Address for Service in the United Kingdom is c/o Abel & Imray, 30 Southampton Buildings, London, W.C.2.

Bedinite. 560,487. Class 1. China clay. English Clays Lovering Pochin & Co., Ltd., 14 High Cross Street, St. Austell, Cornwall.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Canada.—A firm of importers and distributors established at Vancouver wishes to obtain the representation, on a commission or consignment basis, for the Provinces of British Columbia and Alberta of United Kingdom manufacturers of essential oils, drug sundries, chemicals, pharmaceuticals, surgical supplies, soaps and medicated and fancy perfumes in boxes and bulk. (Ref. No. 303.)

Austria.—An agent established at Vienna wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of urea moulding powders. (Ref. No. 311.)

Belgium.—A firm of agents established at Brussels wish to obtain the representation, on a commission basis, of United Kingdom manufacturers of laboratory equipment and material. (Ref. No. 314.)

From Week to Week

BRITISH SUMMER TIME ends at 2 a.m. to-morrow (Sunday). All clocks should be put back one hour to-night.

THE AUGUST ISSUE of "Science and Culture" contains a very interesting article on the storage and use of radium by D. M. Bose, of Calcutta University.

WE HAVE RECEIVED from Sternol, Ltd., a new folder concerning their product Sternoleate, which it is claimed, will free corroded nuts, bots, flanges, pipe joints, etc. It will penetrate rust and destroy corrosion.

AT THE ANNUAL MEETING of the Staveley Coal and Iron Company the chairman, Sir William Bird, stated that in the near future plant was to be installed for the manufacture of sodium chlorate. At the present time, he said, there was no plant in the British Isles for the manufacture of sodium chlorate, and the company felt confident that they could compete successfully with colonial and continental makers.

THE COAL HYDROGENATION PETROL PLANT of Imperial Chemical Industries at Billingham-on-Tees will be formally opened by Mr. Ramsay MacDonald on October 15. Sir Harry McGowan, chairman of I.C.I., is asking a large number of guests to the opening ceremony, which will be one of the most important industrial events that has taken place in the United Kingdom for many years, in that it will mark the start of a new British industry.

IN CONSEQUENCE OF THE VOLUNTARY LIQUIDATION of the British Magnesite Calcining Co., Ltd., the modern works of this concern located at Farnworth and Bold, near Widnes, together with all machinery, plant and equipment, is to be offered at auction on Wednesday, October 16, upon the premises by F. S. Airey, Entwistle and Co. The land area included contains eleven acres freehold, and the works are connected by sidings with the L.M.S. railway adjoining.

G. A. HARVEY AND CO. (LONDON), LTD., will show an extensive range of perforated metals at the Public Works, Roads and Transport Congress and Exhibition. This firm specialises in both perforated metal and woven wire suitable for screening, grinding, separating and filtering purposes such widely different commodities as coal, coke, gravel, ore, sugar, food products and fine chemicals. The range of industrial plant manufactured by the firm includes coolers, reaction vessels, condensers, agitators, extractors, fractioning towers, filters, tar stills and water softening tanks.

THE LONDON AND SOUTH-EASTERN COUNTIES SECTION of the Institute of Chemistry of Great Britain and Ireland is holding a dinner-dance at the Strand Palace Hotel, Strand, W.C.2, on Friday, October 25, from 7 p.m. to midnight. The tickets will be 8s. single and 15s. double. The London Rhythmisicians Dance Band will play. This is the opening event of the new season, and it is hoped that it will provide an opportunity for members to get together socially before the more serious meetings later in the session.

THE COUNCIL OF THE INSTITUTE OF FUEL have pleasure in stating that Mr. Harry Ralph Ricardo, F.R.S., has been nominated as the Melchett Medallist of the Institute of Fuel for the year 1935. Mr. Ricardo will deliver the Melchett Lecture in the lecture theatre of the Geological Society of London, Burlington House, Piccadilly, London, W.1, at 2.30 p.m. on Wednesday, October 9, at which the President of the Institute, Sir John Cadman, D.Sc., will take the chair. Mr. Ricardo, in his address, will deal with matters connected with petrol and diesel engines. Members of any technical institutions interested in the development of internal combustion engines, are cordially invited to be present.

PLANS ARE IN HAND for the erection of the first rayon yarn factory in the Irish Free State. It is understood that the site chosen is in Longford County and that foreign patents will be utilised. As such scheme is dependent upon the imposition of a tariff, the Free State Government is being approached. At present imports of rayon yarn come almost exclusively from the United Kingdom and average between twenty and twenty-five thousand lb. monthly. Thus, in the first place, any factory established could not reckon on sales of more than 250,000 lb. yearly if the whole market was captured. Opinions differ as to whether with such a small output the factory could be made an economic proposition for some years.

THE FIRST MEETING of the Chemical Engineering Group this session will take place on Friday, October 11, at 8 p.m., at the rooms of the Chemical Society, Burlington House, Piccadilly, W.1, when the following paper will be presented: "Some chemical engineering problems in the manufacture of papermakers' cellulose," by Dr. J. L. A. Macdonald, who is chief chemist to Tullis, Russell and Co., Ltd., paper makers, of Markinch, Fife. He is an acknowledged authority on the manufacture of paper—particularly esparto papers—and his paper will deal with the methods of production; plant and process problems; typical celluloses, the special case of esparto, non-cellulose part of the complex and by-products. The chair will be taken by the chairman of the group, Mr. S. Robson.

HOLINTER, LTD., Wheatsheaf House, 4 Carmelite Street, London, E.C.4, have handed over their chemical department to the Chemical Trading Co., Ltd., as from October 1, 1935.

THE MINING DEVELOPMENTS by Scottish Oils, Ltd., at West Calder, are being pushed steadily forward. The pit shafts which are being sunk to the Dunnet shale seam are now down over fifty fathoms and it is expected to reach the shale in about a month's time. The shalefield is an extensive one and will provide work for many years to come.

IMPERIAL CHEMICAL INDUSTRIES, LTD., it is understood, are to introduce a six-shift week instead of the present seven shifts for continuous shift process workers at Billingham. It is anticipated this new system will begin on November 4. If present expectations are realised employment for about another 300 workmen will be found.

THE "NATIONAL PETROLEUM NEWS," of September 26, says that, according to well-informed sources, orders for between 2,500,000 and 3,000,000 barrels of crude oil and heavy fuel oil and approximately 500,000 barrels of gasoline have been placed with American exporters during the past thirty days. A large percentage of the orders has been placed by Italy, although British and French interests have also figured prominently. The paper says that the orders are entirely outside the routine channels, such as contract and inter-company shipments.

SIR JOHN CADMAN, D.Sc., the President-Elect of the Institute of Fuel, will be installed in the Presidential Chair of the Institute by the outgoing President, Sir Harry McGowan, in the lecture theatre of the Geological Society of London, Burlington House, Piccadilly, London, on Wednesday, October 9, at 11.30 a.m. His installation will be followed by the presentation of his address to the members, and will, we understand, contain some very outspoken comments on the subject of solid and liquid fuels. Members of technical societies interested in any form of fuel are cordially invited to be present.

A MEETING OF THE BRITISH SECTION of the International Society of Leather Trades' Chemists will take place on Thursday, October 10, at 10 a.m., at the Agricultural Hall, London, in the room over the management offices. The following papers will be read: "The works chemist in a shoe factory," by Mr. J. Hill; "The hydration of leather," by Dr. C. H. Spiers; "X-ray studies relative to the theories of tanning," by Dr. Dorothy Jordan Lloyd; "Method for determination of buffer salts in leather," by F. C. Thompson; "Chlorinated rubber for use in leather finishing," by Mr. M. C. Lamb and Mr. W. E. Chapman.

COLVILLES, LTD., plan to lay down a new mechanical bar and rod mill which will cost several hundred thousand pounds and will be ready for operation in May or June next year. The site for the new construction is now being cleared, and huge wooden condenser towers are being dismantled. The mill will be of special design, embodying American and Belgian practice. There will be seven stands of continuous rolls in series, followed by four stands of looping rolls in line. The new mill will turn out rods and bars from 1¼ in. down to ⅜ in. diameter. Output will be at least 100 tons per 8-hour shift, equal to 1,600 tons per working week of 16 shifts. This will absorb the ingot output of two melting furnaces.

Personal Notes

DR. F. A. WILLCOX has been elected president of the British Association of Refrigeration.

MR. H. GARNER BENNETT has been appointed works manager to Howroyd, McArthur and Co., of Aintree.

MR. G. FINLAYSON has been appointed chief metallurgist to the Ashanti-Adowsena (Banket) Goldfields, Gold Coast Colony.

MR. W. J. SAVAGE has been appointed engineer and general manager to the Oriental Gas Co., Ltd., Calcutta.

MR. CHARLES EDWARD FOX, Lyndale Green, Leech Lane, Worsley, retired dyer and traveller, who died on June 26, aged 75 years, left estate to the value of £13,674, with net personalty £13,171.

MR. A. PALACHE, a director of Helbert, Wagg and Co., has been appointed chairman of the boards of directors of the Ely Beet Sugar Factory, Ltd., and the King's Lynn Beet Sugar Factory, Ltd., in succession to the late Sir James Martin. He was already a director of both companies.

MR. EDMUND RICK RICHARDSON, 2 Tankerville Terrace, Newcastle-on-Tyne, managing director of the Team Valley Paper Mills, Ltd., Gateshead, and a director of T. Trotter and Son, Ltd., Chirnside Bridge Paper Mills, Berwickshire, left gross estate valued at £57,422, with net personalty of £54,601.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALLEN AND HANBURYS, LTD., London, E.C., mfg. chemists, etc. (M., 5/10/35.) Reg. Sept. 24. Land Registry charge supplemental to Trust Deed dated May 26, 1933; charged on properties at St. Marylebone, etc. *£80,000. Oct. 8, 1934.

New Companies Registered

Lorenco Products, Ltd., 11-12 Finsbury Square, E.C.2.—Registered September 24. Nominal capital £200. Objects: To carry on the business of dealers in metals, minerals, wood, paper, pulp, fibre, skins, wool, leather, textiles glass, oils, drugs, chemicals, seeds, fats, gums and waxes, etc. A subscriber: S. Bregman.

Solvent Recoverers, Ltd., 5 Victoria Road, Lenzie, Dumbartonshire.—Registered September 27. Nominal capital £4,000. Objects: To carry on the business of recovery, purchase and sale of solvents, ect. A subscriber: Alexander H. Tod.

Spencer, Hayes and Co., Ltd., 45 Beaks Hill Road, Kings Norton.—Registered September 27. Nominal capital £200. Objects: To carry on the business of manufacturers of and dealers in food products, raw materials, chemicals, essences, etc. Directors: Harry Worrall, Joseph W. Allen.

Pyrofuge Company (Great Britain), Ltd., 8 Great Winchester Street, E.C.2.—Registered September 25. Nominal capital £100. Objects: To carry on the business of manufacturers of fire extinguishing apparatus, particularly those of the bomb type operating by explosive powder, fire fighting apparatus and other appliances of all kinds for protection against accidental fire or incendiarism, etc. A subscriber: E. R. Mellor.

Universal Emulsifiers, Ltd., 20 Cockspur Street, S.W.1.—Registered September 25. Nominal capital £25,000. Objects: To acquire from Thurston W. Dickeson, of Auckland, New Zealand, the benefit of certain existing inventions relating to improvements in processes for producing, emulsifying, dispensing, wetting, suspending and protecting agents and the like; and to adopt an agreement with Wm. T. A. Proctor, and to carry on the business of chemists, druggists, drysalters, oil and colourmen, etc. Directors: Sir Geo. L. Courthope, Bt., M.C., M.P.; Henry C. Howard, F.C.A.; Thurston W. Dickeson, M.P.S.; Wm. T. A. Proctor; Capt. Geo. I. S. More, R.N.

Change of Name

Phonosan Company, Ltd. (303,545). (Manufacturers of disinfectants for telephones, etc., 88 Mosley Street, Manchester).—Name changed to Johnsanphone, Ltd., by sanction of Registrar on September 17, 1935.

Forthcoming Events

LONDON.

Oct. 2-12.—Exhibition of Inventions. 11 a.m. to 10 p.m. Central Hall, Westminster, London.

Oct. 8.—Institution of Petroleum Technologists. "The Costing of Petroleum Refinery Operations." Gordon Kerr. 5.30 p.m. The Royal Society of Arts, John Street, Adelphi, London.

Oct. 9.—Institute of Fuel. Address by Sir John Cadman. 11.30 a.m. Melchett Lecture by Harry Ralph Ricardo. 2.30 p.m. Lecture Theatre of the Geological Society of London, Burlington House, London.

Oct. 9.—Institution of Chemical Engineers. "Modern Methods of Welding." C. H. Davy. 6 p.m. Burlington House, London.

Oct. 10.—Institute of Vitreous Enamellers (Southern Section). "Opacifiers Used in the Vitreous Enamel Industry." W. Astles. 8 p.m. British Industries House, Marble Arch, London.

Oct. 10.—Institute of Metals (London Section). "Gases and Metals." Dr. C. J. Smithells. 7.30 p.m. 83 Pall Mall, London.

Oct. 10.—International Society of Leather Trades' Chemists (British Section) "The Works Chemist in a Shoe Factory," J. Hill; "The Hydration of Leather," Dr. C. H. Spiers; "X-ray Studies Relative to the Theories of Tanning," Dr. Dorothy Jordan Lloyd; "Method for Determination of Buffer Salts in Leather," F. C. Thompson; "Chlorinated Rubber for Use in Leather Finishing," M. C. Lamb and W. E. Chapman. 10 a.m. Agricultural Hall, London.

Oct. 11.—Chemical Engineering Group. "Some Chemical Engineering Problems in the Manufacture of Papermakers' Cellulose." Dr. J. L. Macdonald. 8 p.m. Burlington House, London.

Oct. 11.—British Association of Refrigeration. Annual Banquet, Park Lane Hotel, Piccadilly, London.

BRISTOL.

Oct. 7.—Institute of Chemistry. "Food and the Consumer," Dr. G. W. Monier Williams. 5.30 p.m. University Chemical Department (Woodland Road), Bristol.

GLASGOW.

Oct. 11.—Oil and Colour Chemists' Association (Scottish Section). Social evening and short papers. 7.30 p.m. Glasgow.

Oct. 11.—Andersonian Chemical Society. Presidential address by A. Urie. 3 p.m. Royal Technical College, Glasgow.

LIVERPOOL.

Oct. 10.—Institute of Chemistry (Liverpool Section). "As Others See Us." B. D. W. Luff. 7.30 p.m. Constitutional Club, India Buildings, Water Street, Liverpool.

MANCHESTER.

Oct. 10.—Chemical Society. Joint meeting with the Manchester Sections of the Institute of Chemistry and the Society of Chemical Industry. "Modern Structural Chemistry." Professor N. V. Sidgwick. Lecture Theatre of the Manchester Central Library, St. Peter's Square, Manchester.

SHEFFIELD.

Oct. 11.—Institute of Metals (Sheffield Section). "Lead Mining in Derbyshire." L. B. Williams. 7.30 p.m. University, St. George's Square, Sheffield.

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